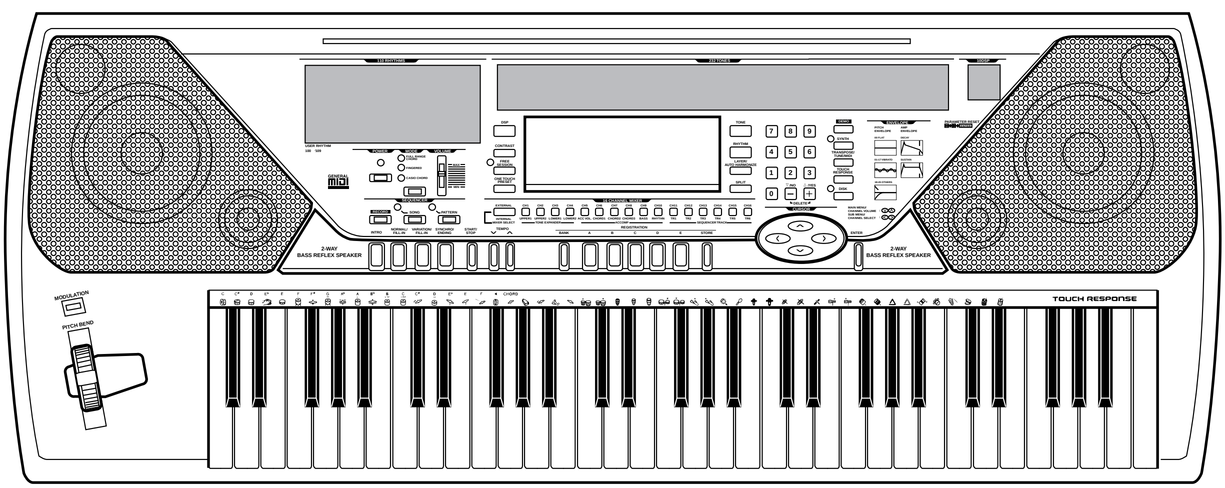
CASIO®

Service Manual

(without price)

CTK-811EX

JUL.1998



CTK-811

INDEX

GM SOUND KEYBOARD

CONTENTS

SAFETY NOTICE

CAUTION!
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

DENMARK:

ADVARSE!
Lithiumbatteri. Eksplosionsfare ved fejlagtig handtering.
Udskiftning ma kun ske med batteri af samme fabrikat og type.
Lever det brugte batteri tilbage tili leverandoren.

FINLAND:

VAROITUS
Paristo voiäjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan valmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

SWEDEN:

VARNING
Felaktigt batteribyte kan medf fara för explosion. Använd därför endast samma typ eller likvärdig typ enligt apparattillverkarens rekommendation.
Kassera förbrukade batterier enligt tillverkarens anvisning.

SPECIFICATIONS

GENERAL

Keyboard: 61 standard-size keys, 5 octaves (with touch response on/off; ExLight/Light/Normal/Heavy touch)

Tones: 232 (128 General MIDI, 64 variation, 8 drum, 32 user); with layer and split

Rhythm instrument tones: 53

Polyphony: 32 notes maximum (16 for certain tones)

Digital effects: 10 (REVERB 1, 2, 3; CHORUS; TREMOLO; PHASE SHIFTER; ORGAN SPEAKER; ENHANCER; FLANGER; EQ LOUDNESS)

Auto accompaniment
- Rhythm patterns: 110 (100 + 10 user rhythms)
- Tempo: Variable (226 steps, ♩ = 30 to 255)
- Chords: 3 fingering methods (CASIO CHORD, FINGERED, FULL RANGE CHORD)
- Rhythm controller: Start/Stop, Intro, Normal/Normal Fill-In, Variation/Variation Fill-In, Synchro/Ending
- Accomp volume: 0 to 127 (128 steps)
- One touch presets: Recalls settings for tone, tempo, layer, and Auto Harmonize in accordance with rhythm.
- Auto harmonize: Automatic addition of notes that harmonize with melody note in accordance with specified Auto Accompaniment chords.

Free session
- Number of patterns: 100 (Auto Accompaniment function based on preset chord progressions.)

Song sequencer
- Songs: 2
- Recording tracks: 6 (2 through 6 are melody tracks)
- Recording method: Real-time
- Memory capacity (total for two songs): Approximately 4,900 notes
- Punch in: Supported

Pattern sequencer
- Number of patterns: 10 (Rhythm numbers 100 to 109)
- Memory capacity: Approximately 7,000 notes
- Elements: Intro, Normal, Variation, Normal Fill-In, Variation Fill-In, Ending
- Parts: Chord 1, 2, 3; Bass; Rhythm
- Recording method: Real-time

Registration memory
- Number of setups: 20 (5 setups × 4 banks)
- Memory contents: Tone, Rhythm, Tempo, Split on/off, Split point, Layer on/off, Auto Harmonize on/off, Mixer settings, Keyboard channel on/off, DSP (digital effect) on/off, DSP (digital effect) settings, Accompaniment mode, Touch Response settings, Assignable jack setting, Transpose, Tuning, Pitch Bend range, Sound range shift on/off

Demo tunes: 2

Synthesizer
- Parameters: PCM set, amp envelope set, attack rate, release rate, pitch envelope set, pitch, level, touch sensitivity, pan, filter sensitivity, filter level, transpose

Mixer
- Channels: 16
- Modes: Internal, External, External/Solo, External/Play
- Parameters: Program change number, volume, expression, pan, coarse tuning, fine tuning, Effect Send

MIDI: 16-channel multi-timbre receive, General MIDI Level 1

Other functions

Pitch bend range:	Adjustable (12 semitones upwards and downwards)
Modulation:	Equipped
Transpose:	25 steps (–12 semitones to +12 semitones)
Tuning:	Adjustable (A4 = approximately 440Hz ± 50 cents)

Terminals

MIDI terminal:	IN, OUT
Sustain/Assignable jack:	Standard jack (sustain, sostenuto, soft, rhythm start/stop)
Headphones/Output:	Stereo standard jack Output Impedance: 250 Ω Output Voltage: 5 V (RMS) MAX 12 V DC

Floppy disk drive

Type:	3.5" FDD
Formats:	2DD (720KB MS-DOS format) 2HD (1.44MB MS-DOS format)
Functions:	Save and load of user tones, user rhythms, sequencer, and registration data; playback of SMF; disk formatting; file delete; accompaniment pattern style conversion

Power supply:	Dual power supply system
Batteries	Six D-size batteries
Battery life	Approximately 3 hours continuous operation on alkaline batteries
AC adapter:	AD-12
Auto power off:	Turns power off approximately six minutes after last key operation. Enabled under battery power only, can be disabled manually.
Speaker output:	5 W + 5 W
Power consumption:	12 V ⎓ 18 W
Dimensions:	109.2 × 42.7 × 15.7 cm (43 1/16 × 16 13/16 × 6 3/16 inch)
Weight (without batteries):	Approximately 9.2 kg (20.3 lbs)
Standard accessories:	Music Stand; Pattern Conversion Disk; Data Disk; Disk User's Guide; Keyboard User's Guide

ELECTRICAL

Current drain with 12 V DC:		
No sound output		440 mA ± 20 %
Maximum volume with 10 keys from C3 to E4 pressed in whistle tone Volume: MAX., Velocity: MAX. DSP0: Reverb1, FDD: Replay		2000 mA ± 20 %
Phone output level (Vrms with 8 Ω load each channel):		
with tone Synth-Bass 4 tone	L-ch (Key C4)	100 mV ± 20 %
Volume: MAX., Velocity: MAX.	R-ch (Key F3)	92 mV ± 20 %
DSP0: Reverb1		
Speaker output level (Vrms with 8 Ω load each channel):		
with tone Synth-Bass 4 tone	L-ch (Key D3)	7.1 mV ± 20 %
Volume: MAX., Velocity: MAX.	R-ch (Key F3)	6.2 mV ± 20 %
DSP0: Reverb1		
Output level (Vrms with 47 kΩ load each channel):		
with tone Synth-Bass 4 tone	L-ch (Key C4)	3200 mV ± 20 %
Volume: MAX., Velocity: MAX.	R-ch (Key F3)	3100 mV ± 20 %
DSP0: Reverb1		
Minimum operating voltage:		6.1 V

IMPORTANT OPERATION

Full Initialization
Use this procedure to return all keyboard settings to what they were when you purchased it. Note that this procedure clears all data from memory.

- While holding down the ENTER button, turn on keyboard power.

Reset?

- Press YES to initialize the keyboard or NO to turn on power without changing any settings.

Parameter Initialization
Use this procedure to return all keyboard settings to what they were when you purchased it. Note that this procedure does not affect user tones, user rhythms, registration memory contents, and display contrast settings.

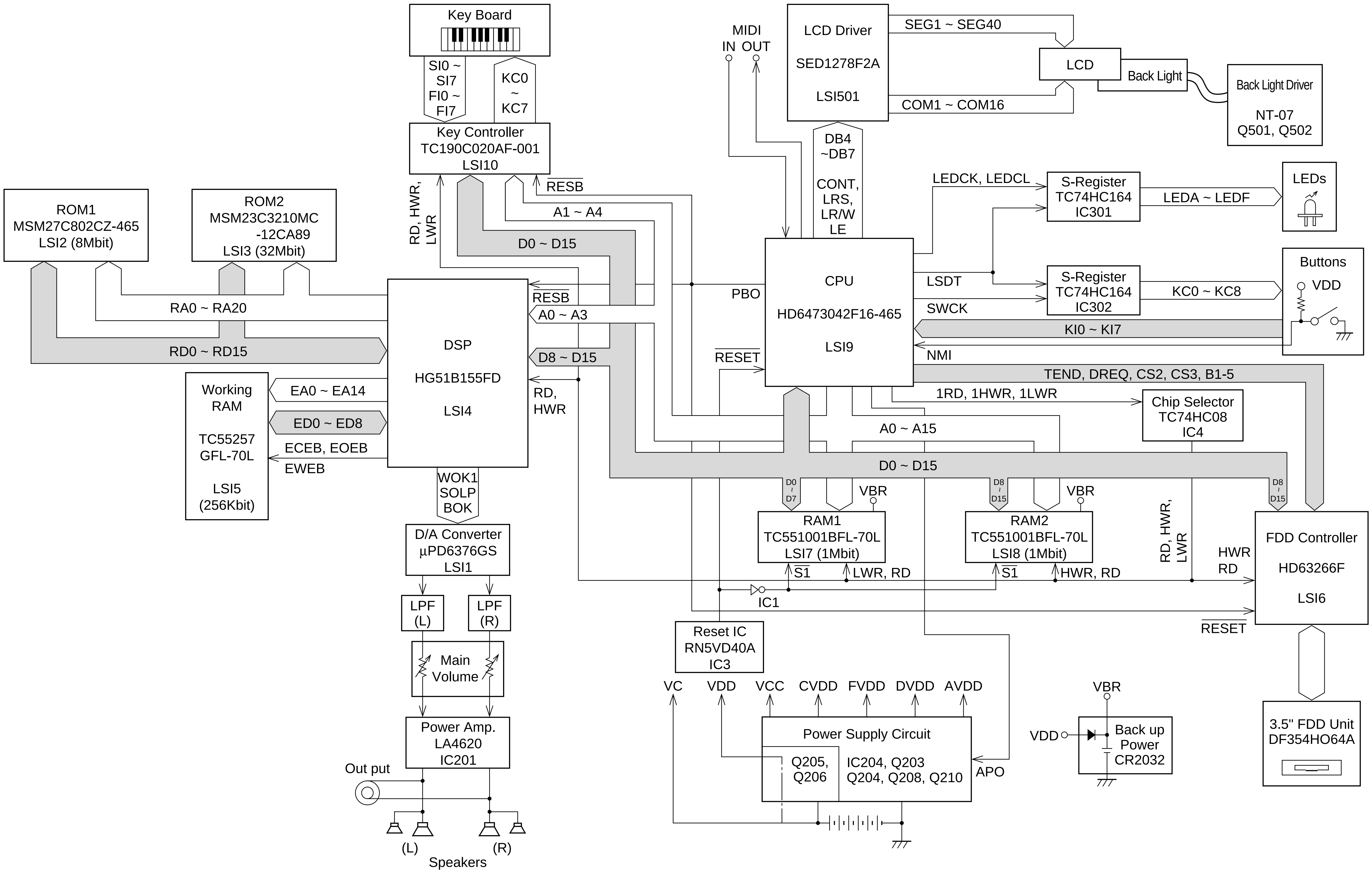
- While keyboard power is on, press the [+], [–], and ENTER buttons at the same time.

Adjusting Display Contrast
- Display contrast can be adjust to one of 100 levels for easy viewing.
- Adjusting display contrast helps to make figures easier to read from any viewing angle.
- Within five seconds after pressing the CONTRAST button, press [+] to increase the contrast value (making the display darker) or [–] to decrease it (making the display lighter).
- After you release CONTRAST, the message “Contrast” remains on the display for a few moments, during which you can change the contrast setting further using [+] and [–] or by inputting a contrast value with the number keys.
  The contrast can be set to a value from 0 to 99. The initial default setting is 50.

GM (General MIDI):
General MIDI standardizes MIDI data to play music with same nuance between different MIDI instruments. Among GM conformed MIDI instruments, or commercially available musical data, music can be played with similar tones.

SMF (Standard MIDI File):
SMF is a standard file format for MIDI instruments and computer music software. SMF formatted data can be played and transported easily among SMF complied instruments or musical data of different manufacturers.

BLOCK DIAGRAM

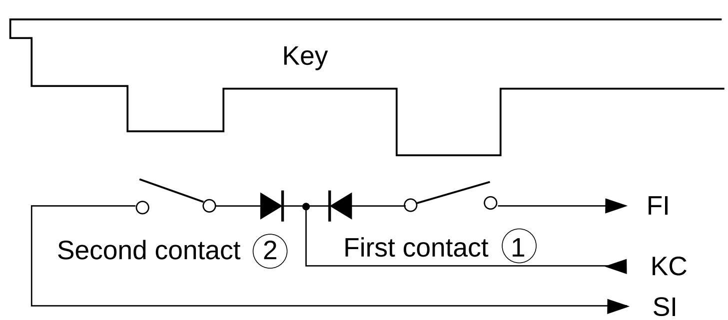


CIRCUIT DESCRIPTION

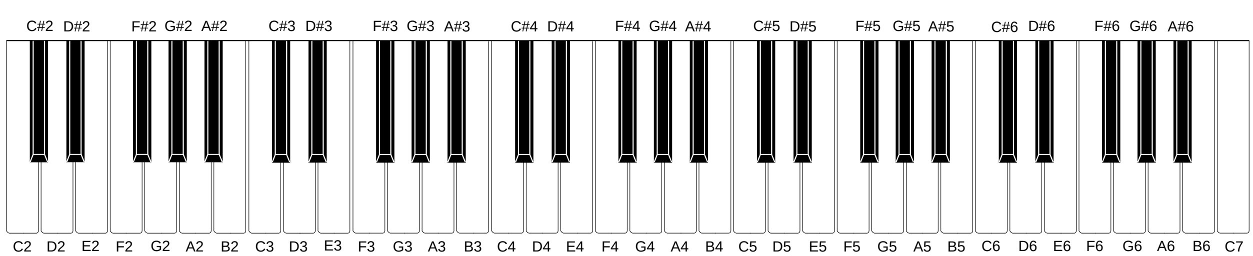
KEY MATRIX

	KC0	KC1	KC2	KC3	KC4	KC5	KC6	KC7
FI0	C2 ①	C#2 ①	D2 ①	D#2 ①	E2 ①	F2 ①	F#2 ①	G2 ①
SI0	C2 ②	C#2 ②	D2 ②	D#2 ②	E2 ②	F2 ②	F#2 ②	G2 ②
FI1	G#2 ①	A2 ①	A#2 ①	B2 ①	C3 ①	C#3 ①	D3 ①	D#3 ①
SI1	G#2 ②	A2 ②	A#2 ②	B2 ②	C3 ②	C#3 ②	D3 ②	D#3 ②
FI2	E3 ①	F3 ①	F#3 ①	G3 ①	G#3 ①	A3 ①	A#3 ①	B3 ①
SI2	E3 ②	F3 ②	F#3 ②	G3 ②	G#3 ②	A3 ②	A#3 ②	B3 ②
FI3	C4 ①	C#4 ①	D4 ①	D#4 ①	E4 ①	F4 ①	F#4 ①	G4 ①
SI3	C4 ②	C#4 ②	D4 ②	D#4 ②	E4 ②	F4 ②	F#4 ②	G4 ②
FI4	G#4 ①	A4 ①	A#4 ①	B4 ①	C5 ①	C#5 ①	D5 ①	D#5 ①
SI4	G#4 ②	A4 ②	A#4 ②	B4 ②	C5 ②	C#5 ②	D5 ②	D#5 ②
FI5	E5 ①	F5 ①	F#5 ①	G5 ①	G#5 ①	A5 ①	A#5 ①	B5 ①
SI5	E5 ②	F5 ②	F#5 ②	G5 ②	G#5 ②	A5 ②	A#5 ②	B5 ②
FI6	C6 ①	C#6 ①	D6 ①	D#6 ①	E6 ①	F6 ①	F#6 ①	G6 ①
SI6	C6 ②	C#6 ②	D6 ②	D#6 ②	E6 ②	F6 ②	F#6 ②	G6 ②
FI7	G#6 ①	A6 ①	A#6 ①	B6 ①	C7 ①			
SI7	G#6 ②	A6 ②	A#6 ②	B6 ②	C7 ②			

Note: Each key has two contacts, the first conatct ① and second contact ②.



NOMENCLATURE OF KEYS



BUTTON MATRIX

	KI0	KI1	KI2	KI3	KI4	KI5	KI6	KI7
KC0	MODE	INTRO	MIXER SELECT	CH8	A	CH16	SPLIT	H/NO —
KC1	RECORD	NORMAL/ FILL-IN	CH1	CH9	B	E	LAYER/ AUTO HARMO	2
KC2	SONG	VARIATION/ FILL-IN	CH2	CH10	C	H	RHYTHM	5
KC3	PATTERN	SYNCHRO/ ENDING	CH3	CH11	D	ENTER	TONE	8
KC4	DSP	START/ STOP	CH4	CH12	E	DISK	0	G/YES +
KC5	CON- TRAST	TEMPO G	CH5	CH13	STORE	TOUCH RESPONSE	1	3
KC6	FREE SESSION	TEMPO H	CH6	CH14	G	TRANS- POSE	4	6
KC7	ONE TOUCH PRESET	BANK	CH7	CH15	F	SYNTH	7	9

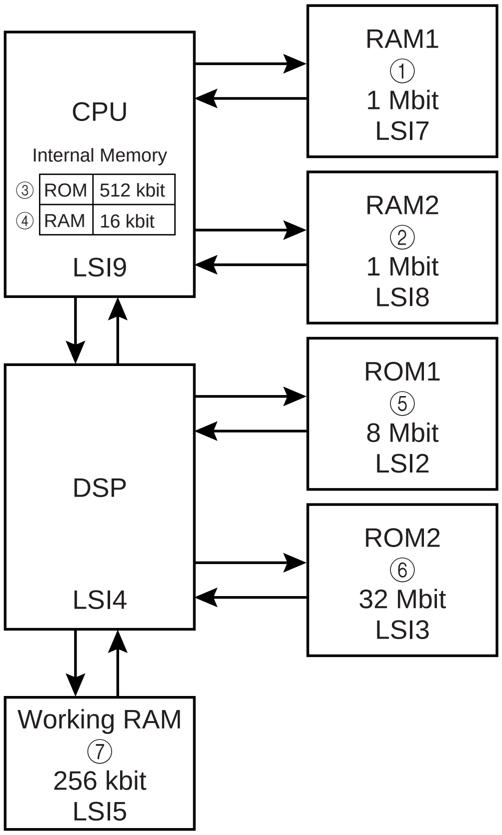
DMSW	DEMO

LED MATRIX

LED-A	LED-B	LED-C	LED-D	LED-E	LED-F
FULL RANGE CHORD	FINGERD	CASIO CHORD	FREE SESSION	SYNTH	DISK

MEMORY DEVICES

Each memory device has the following data.



① RAM1 :
S-RAM for operation program, Register, Pattern, Song and SMF data from FDD. (Lower part of data bus)

② RAM2 :
S-RAM for operation program, Register, Pattern, Song and SMF data from FDD. (Upper part of data bus)

③ Internal ROM of CPU :
Main program data for system operation

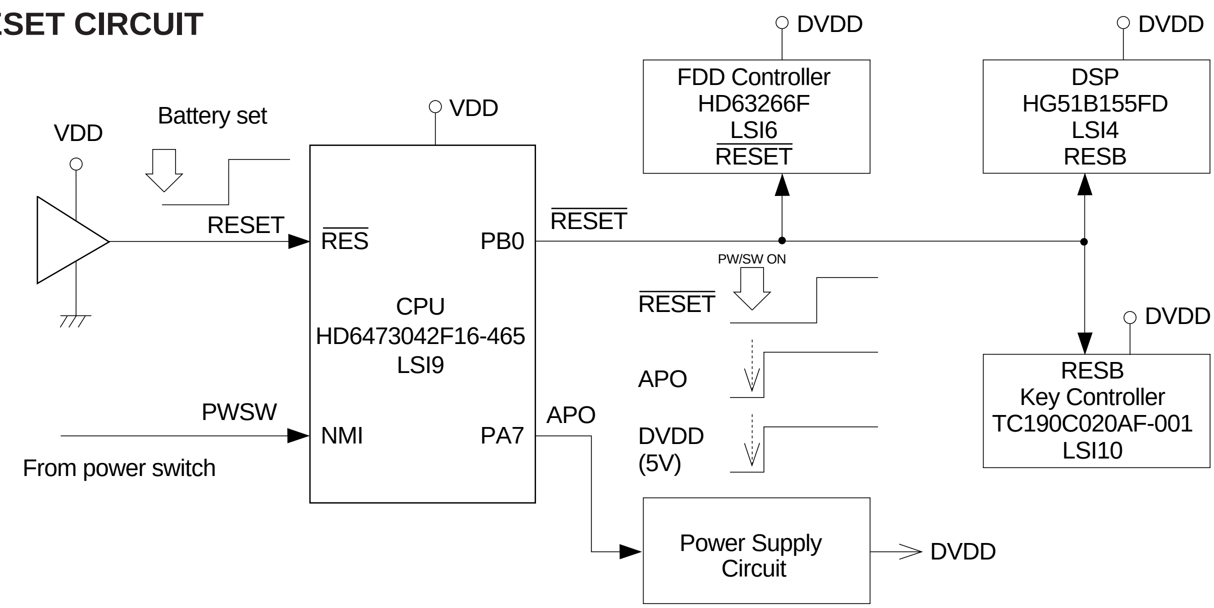
④ Internal RAM of CPU :
Work area for system operation

⑤ ROM1 :
Demo, Accompaniment data, Song, Pattern, Synth, Disk mode

⑥ ROM2 :
Sound Waveforms/Tone data Digital sound effect

⑦ Working RAM :
Work area for DSP

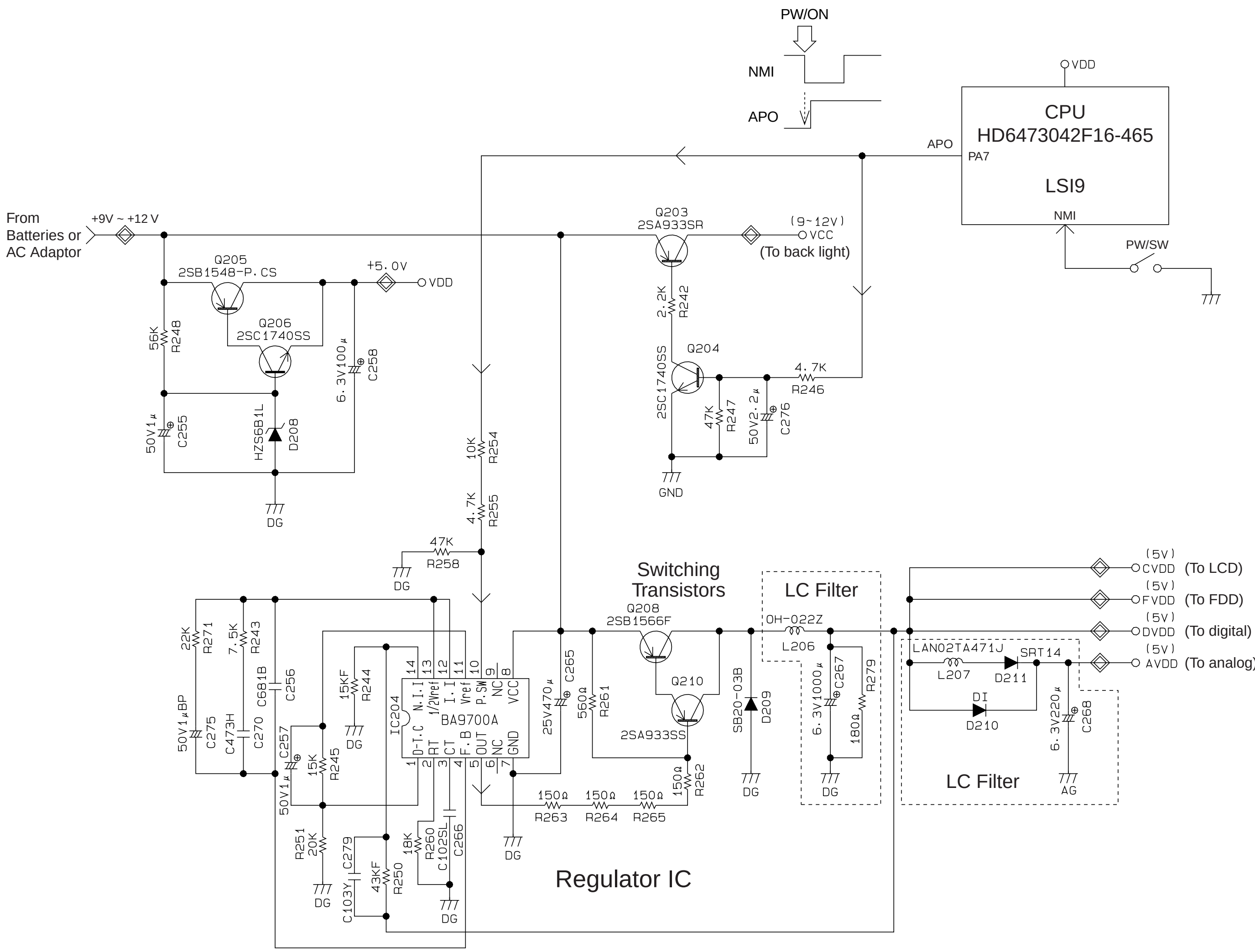
RESET CIRCUIT



Initial reset
When batteries are set or an AC adapter is connected, the reset IC provides a low pulse to the CPU. When the power switch is pressed, the CPU receives a low pulse of POWER signal. The CPU first raises APO signal to +5 V to generate DVDD voltage, then raises RESET signal to +5 V. During this period the DSP, the key controller and FDD controller LSIs initialize their internal circuits.

POWER SUPPLY CIRCUIT

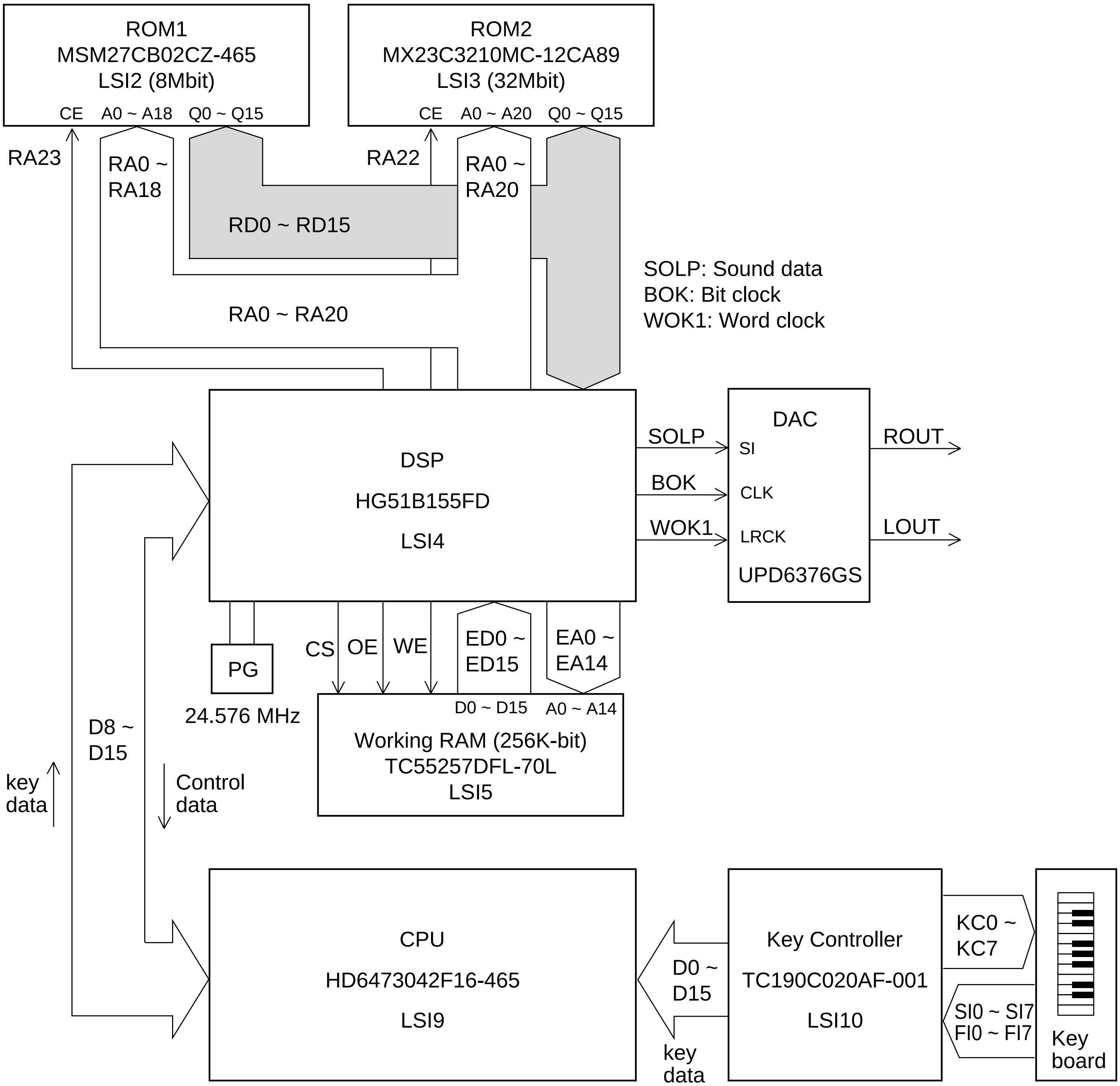
The power supply circuit provides various voltages as shown below.
The voltage VDD (+5 V) is provided as long as batteries or AC adaptor is set.
Other voltages are controlled by APO (Auto Power Off) signal from CPU.



The regulator IC BA9700A generates square waveform from pin 5 as PWM (Pulse Wide Modulation).
The LC filter makes stable output voltage (+5 V) for each circuit as shown above.

DSP and DAC CIRCUIT

The DSP (Digital Signal Processor) and DAC (Digital Analog Converter) consists of the following circuits.

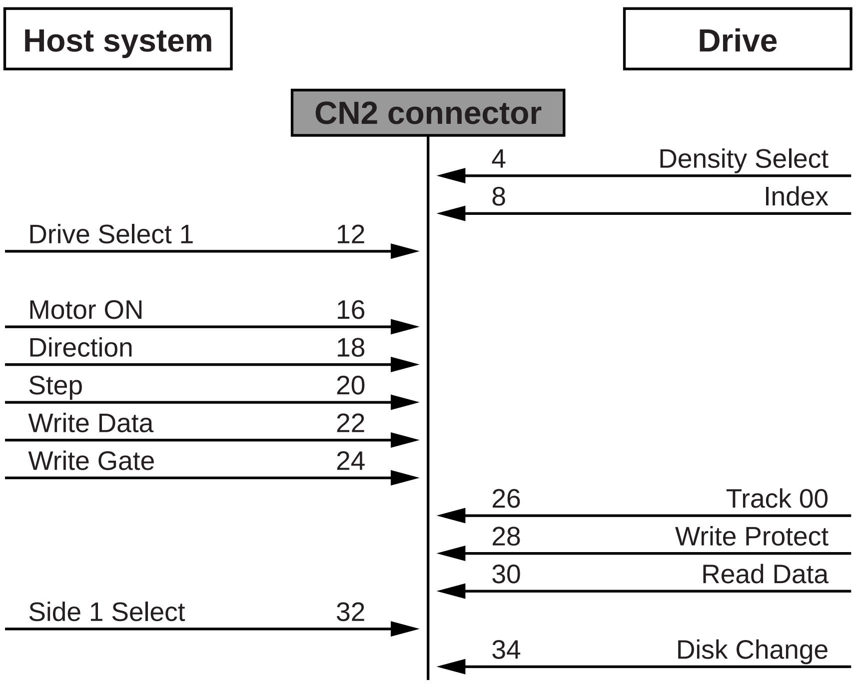


FDD UNIT (DF354H064A)

FDD Specifications:

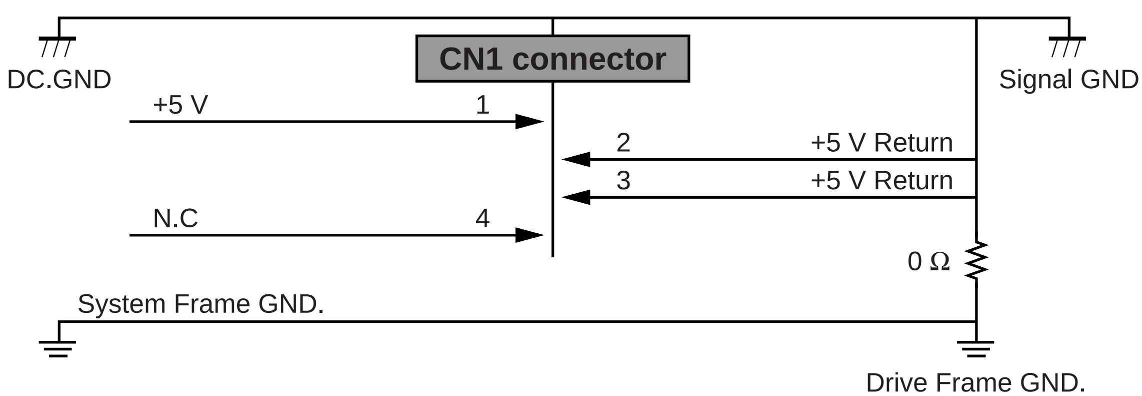
① Memory Capacity (under un-format) : 1.6 MByte
② Density of track : 5.33 track/mm (135 TPI)
③ Number of track : 77 track/side
④ Number of head : 2
⑤ Rate of data transfer : 500 kbps
⑥ Access time (between two tracks) : 3 m seconds
⑦ Compensation of writing data : 125 n second (all tracks)
⑧ Rotation speed : 360 Min^{-1} (rpm) ± 1.5 %

FDD Interface:

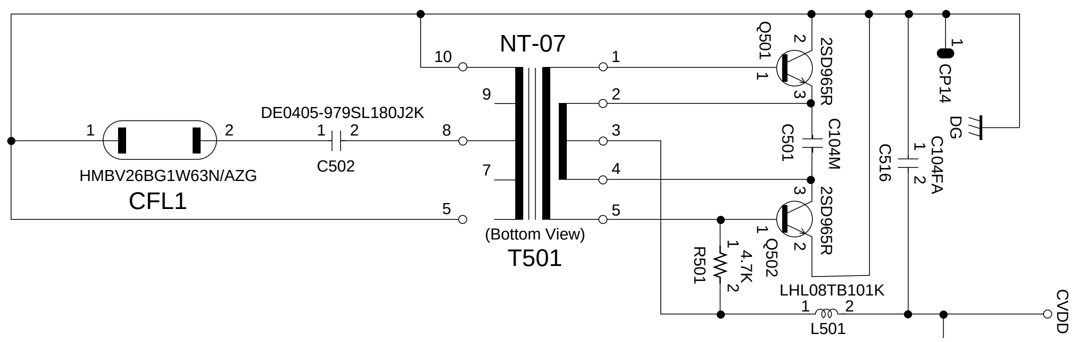


GND Pin Numbers of CN2:
1, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33

Non connected Pin Numbers of CN2:
2, 6, 10, 14 (Pin #3 is removed to prevent erroneous insertion)



LCD BACKLIGHT



When voltage CVDD is supplied, transistors Q501 and Q502 start oscillation.
From the oscillation voltage, transformer T501 generates about 600 V which is necessary for lighting the backlight.

CPU (LSI9: HD6473042F16-465)

The 16 bit CPU contains a 512K-bit ROM, a 16K-bit RAM, eleven 8-bit I/O ports, an A/D converter and serial interfaces. The CPU accesses to the RAM1, RAM2, DSP, Key controller, FDD controller and LCD driver LSI. The CPU also controls buttons, LEDs, bender input and MIDI input/output.

Pin No.	Terminal	In/Out	Function
1	VCC	In	VCC (5 V) source.
2 ~ 5	PB0 ~ PB3	Out	Data bus for LCD driver.
6	PB4	Out	Chip enable signal for LCD driver.
7	PB5	Out	Read/write signal for LCD driver.
8	$\overline{\text{DREQ0}}$	—	DMA (Direct Memory Access) request.
9	PB7	Out	Register selection signal for LCD driver.
10	$\overline{\text{RES0}}$	In	Not used.
11	VSS	In	Ground terminal (0 V).
12	TXD0	Out	MIDI signal output.
13, 15 ~ 17	P91, P93~P95	In	Key input signal from buttons.
14	RXD0	In	MIDI signal input.
18 ~ 21 23 ~ 34	D0 ~ D15	In/Out	Data bus.
22	VSS	In	Ground terminal (0 V).
35	VCC	In	Vcc (5 V) source.
36 ~ 43, 45 ~ 56	A0 ~ A19	Out	Address bus.
44, 57	VSS	In	Ground terminal (0 V).
55, 59, 60	P52, P61, P62	In	Key input signal from buttons.
58	$\overline{\text{WAIT}}$	—	Not used.
61	CLKOUT	Out	Clock signal (16 MHz).
62	$\overline{\text{STBY}}$	—	Not used.
63	$\overline{\text{RES}}$	In	Reset signal at VDD (5 V) supplied.
64	NMI	In	Power ON signal input.
65	VSS	In	Ground terminal (0 V).
66, 67	EXTAL, XTAL	In	Clock (16 MHz) input.
68	VCC	In	Vcc (5 V) source.
69	$\overline{\text{AS}}$	—	Not used.
70	$\overline{\text{RD}}$	Out	Read signal.
71	$\overline{\text{HWR}}$	Out	Write signal for upper data bus.
72	$\overline{\text{LWR}}$	Out	Write signal for lower data bus.
73 ~ 75	MD0 ~ MD2	In	Mode selection terminals.
76, 77	AVCC, VREF	In	Power source and reference voltage for internal A/D, D/A.
78	AN0	In	Battery voltage detection (Not used).
79	AN1	In	Pitch bender voltage detection.

Pin No.	Terminal	In/Out	Function
80	P72	In	AC adaptor detection terminal.
81	P73	In	Modulation signal input.
82	P74	In	Pedal signal input.
83	P75	In	FD sheet type (2HD, 2DD) signal input.
84	P76	In	Key input signal from buttons.
85	DA1	Out	LCD contrast control voltage output.
86	AVSS	In	Ground terminal (0 V).
87	PB0	Out	Reset signal for DSP, Key controller, FDD controller.
88	$\overline{\text{CS3}}$	Out	Chip select signal for FDD.
89	$\overline{\text{CS2}}$	Out	Acknowledge signal FDD DMA function.
90	$\overline{\text{CS1}}$	Out	Chip select signal for Key controller.
91	$\overline{\text{CS0}}$	Out	Chip select signal for DSP.
92	VSS	In	Ground terminal (0 V).
93	$\overline{\text{TEND}}$	Out	End signal for data transfer of FDD.
94	PA1	Out	Change signal for data transfer speed of FDD.
95	PA2	Out	Key input signal for DEMO button.
96	PA3	Out	Clock signal for shift register of KC signal.
97	PA4	Out	Clear signal for shift register of LED.
98	PA5	Out	Control signal for KC signal and LED.
99	PA6	Out	Clock signal for shift register of LED.
100	PA7	Out	APO (Auto Power Off) signal.

DIGITAL SIGNAL PROCESSOR (LSI4:HG51A115A01FD)

Upon receipt of note numbers and their velocities, the DSP (Digital Signal Processor) reads sound and velocity data from the sound source ROM in accordance with the selected tone; the DSP can read rhythm data simultaneously when a rythm pattern is selected. Then it provides 16-bit serial signals containing data of the melody, chord, bass, and percussion to the DAC. The DSP also adds the selected effect to the sound data using a 256k-bit RAM.
The following table shows the pin functions of the DSP.

Pin No.	Terminal	In/Out	Function
1 ~ 8	CD0 ~ CD7	In/Out	Data bus
9, 10			Not used.
11	GND7	In	Ground (0 V) source
12	CK16	Out	24.576 MHz clock output
13	VCC6	In	+5 V source
14	CK0	In	Clock input. Connected to terminal CK16.
15	TCKB		Not used.
16	VCC1	In	+5 V source
17	GND1	In	Ground (0 V) source
18, 19	XT0, XT1	In/Out	24.576 MHz clock input/output. Connected to a crystal oscillator.
20	SGL	In	System control terminal. Single chip system: Open
21	CCSB	In	Chip select signal input
22 ~ 25	CA0 ~ CA3	In	Address bus
26	CE0	In	Not used. Connected to ground.
27	CWRB	In	Write enable signal
28	CRDB	In	Read enable signal
29 ~ 32			Not used.
33	RESB	In	Reset signal input
34	TESB	In	Not used. Connected to +5 V
35 ~ 39			Not used.
40 ~ 49 52 ~ 57	RD0 ~ RD15	In	Data bus for the ROM1 and ROM2
58	RA23	Out	Chip select signal for the ROM1
59	RA22	Out	Chip select signal for the ROM2
60	RA21	Out	Not used.
61 ~ 73 75 ~ 82	RA0 ~ RA20	Out	Address bus for the ROM1 and ROM2
74	GND5	In	Ground (0 V) source
83	WOK2	Out	Word clock output. Not used.
84	VCC3	In	+5 V source
85	GND3	In	Ground (0 V) source
86	WOK1	Out	Word clock for the DAC
87	SOLM	Out	Serial data output. Not used.
88	SOLP	Out	Serial data output for the DAC
89	BOK	Out	Bit clock output for the DAC

Pin No.	Terminal	In/Out	Function
90 ~ 92			Not used.
93	VCC	In	+5 V source
94, 95 97 ~ 105 107, 109 110, 112	EA0 ~ EA14	Out	Address bus for the working RAM
96	EWEB	Out	Write enable signal output for the working RAM
106	EOEB	Out	Read enable signal output for the working RAM
108	VCC7	In	+5 V source
111	ECEB	Out	Chip select signal output for the working RAM
113 ~ 117			Not used.
118	VCC4	In	+5 V source
119	GND4	In	Ground (0 V) source
120 ~ 122			Not used.
123 ~ 130	ED0 ~ ED7	In/Out	Data bus for the working RAM
131	GND5	In	Ground (0 V) source
132 ~ 134			Not used. Connected to ground.
135, 136			Not used.

FDD CONTROLLER (LSI6:HD63266F)

The FDD (Floppy Disk Drive) controller can control the FDD unit.
The controller contains not only analog VFO (Variable Frequency Oscillator) circuit but also driver/receiver, input/output port and oscillation circuit internally.

Pin No.	Terminal	In/Out	Function
1	8/ - 5	In	Change of data transfer speed.
2	XTALSEL	—	Not used. Connected to ground (0 V).
3	$\overline{\text{RESET}}$	In	Reset signal input.
4	E, -RD	In	Read signal.
5	R/-W, -WR	In	Write signal.
6	$\overline{\text{CS}}$	In	Chip select signal.
7	$\overline{\text{DACK}}$	In	Acknowledge signal of DMA (Direct Memory Access).
8, 9	RS0, RS1	In	Register selection for read/write.
10, 11	VSS1, VSS2	In	Ground terminal (0 V).
12 ~ 19	D0 ~ D7	In/Out	Data bus.
20	$\overline{\text{DREQ}}$	In	Request signalof DMA.
21	$\overline{\text{IRQ}}$	—	Not used.
22	$\overline{\text{DEND}}$	In	End signal for data transfer.
23	VSS3	In	Ground terminal (0 V).
24	1/2 EX1	—	Not used.
25	VCC1	In	DVDD (5 V) source.
26, 27, 28	NUM1, NUM2 IFS	—	Not used. Connected to ground (0 V).
29	SFORM	In	Selection signal for formatting.

Pin No.	Terminal	In/Out	Function
30	$\overline{INP}$	In	Disk detection signal.
31	$\overline{READY}$	In	Ready signal from FDD. (Connected to ground (0V).)
32	$\overline{WPRT}$	In	Write protect signal from FDD.
33	$\overline{TRKO}$	In	Track0 signal from FDD.
34	$\overline{INDEX}$	In	Index signal from FDD.
35	$\overline{RDATA}$	In	Read data signal from FDD.
36, 37, 38 39	XTAL2, EXTAL2 NC, XTAL1	—	Not used.
40	EXTAL1	In	Clock signal input from CPU (16 MHz).
41, 42	VSS4, VSS5	In	Ground terminal (0 V).
43	NC	—	Not used.
44 ~ 46	VCC2, VCC3, VCC4	In	DVDD (5 V) source.
47	$\overline{WGATE}$	Out	Write gate signal to FDD.
48	$\overline{WDATA}$	Out	Write data signal to FDD.
49	VSS6	In	Ground terminal (0 V).
50	$\overline{STEP}$	Out	Step signal for FDD head.
51	$\overline{HDIR}$	Out	Head direction signal for FDD.
52	HLOAD	Out	Not used.
53	$\overline{HSEL}$	Out	Head selection signal for FDD.
54	VSS7	In	Ground terminal (0 V).
55	$\overline{DS0}$	Out	Drive selection signal.
56, 57, 58	$\overline{DS1}$, $\overline{DS2}$, $\overline{DS3}$	—	Not used.
59	VSS8	In	Ground terminal (0 V).
60	$\overline{MON0}$	Out	Motor ON signal for FDD.
61, 62, 63	$\overline{MON1}$, $\overline{MON2}$, $\overline{MON3}$	—	Not used.
64	VSS9	In	Ground terminal (0 V).

KEY TOUCH LSI (LSI10: TC190C020AF-001)

By counting the time between first-key input signal FI and second-key SI from the keyboard unit, the key touch LSI detects key velocity of 256-step. Then the LSI sends the CPU the note number and its velocity data.

Pin No.	Terminal	In/Out	Function
1	WRB	In	Write signal from CPU.
2 ~ 11, 13, 14, 16 ~ 19	D0 ~ D15	In/Out	Data bus.
12	VSS	In	Ground terminal (0 V).
15	VDD	In	VDD (5 V) source.
20 ~ 23	CA0 ~ CA3	In	Address bus.
24	VSS	In	Ground terminal (0 V).
25 ~ 32, 34, 35	FI0 ~ FI4, SI0 ~ SI4	In	Key input signal.
33	VDD	In	VDD (5 V) source.
36 ~ 38, 40 ~ 44	KC0 ~ KC7	Out	Key scan signal.
39	VSS	In	Ground terminal (0 V).
45	VDD	In	VDD (5 V) source.
46 ~ 51	FI5 ~ FI7 SI5 ~ SI7	In	Key input signal.
52	VSS	In	Ground terminal (0 V).
53 ~ 58, 60 ~ 62	FI8 ~ FI10 SI8 ~ SI10 KI0 ~ KI2	In	Key input signal (Not used).
59	VDD	In	VDD (5 V) source.
63, 64	MODE0, MODE1	—	Not used.
65	VSS	In	Ground terminal (0 V).
66	KCKI	In	Clock signal for key common/input.
67 ~ 72, 74 ~ 77		—	Not used.
73	VDD	In	VDD (5 V) source.
78	RESB	In	Reset signal from CPU.
79	CSB	In	Chip selection signal.
80	RDB	In	Read signal from CPU.

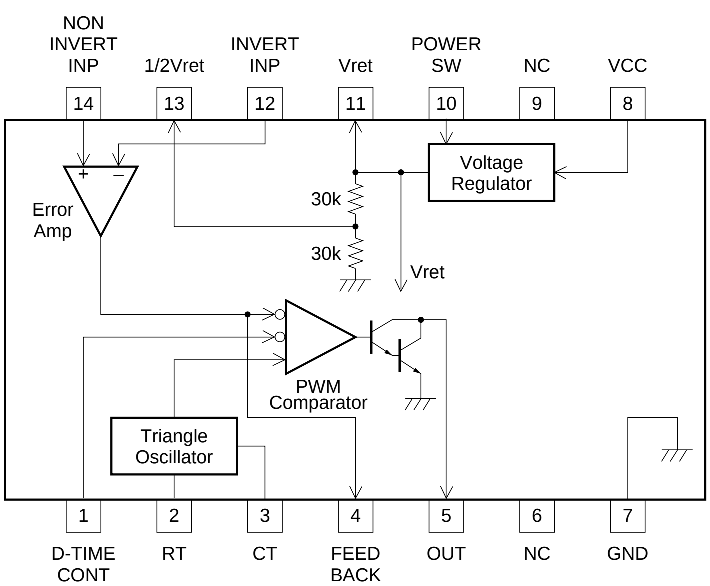
LCD DRIVER (LSI501: SED1278F2A)

The LCD driver can drive a dot matrix LCD having 40 segment and 16 common lines. The LSI contains 240 graphic symbols in the built-in character generator ROM, and stores 80 characters in the built-in display data RAM. In accordance with command from the CPU, the LSI is capable of displaying up to 16 characters simultaneously. The following table shows the pin functions of LSI 501.

Pin No.	Terminal	In/Out	Function
1 ~ 22, 63 ~ 80	SEG1 ~ SEG40	Out	Segment signal output
23	VSS	—	GND (0 V) source
24, 25	OSC1, OSC2	In/Out	Terminals for the built-in clock pulse generator. The external resistor connected determines the oscillation frequency.
26 ~ 30	V1 ~ V5	In	LCD drive voltage input. Those voltages are used for generating the stepped pulse of the LCD drive signals.
31, 32	LP, XSCL	—	Not used
33	VDD	In	LVDD (+5 V) source
34, 35	FR, DO	—	Not used
36	RS	In	Data/command determination terminal.High: data, Low: command
37	R/W	In	Read/write terminal. High: read, Low: write
38	E	In	Chip enable signal. High: enable, the writing is done at fall edge. Low: disenable
39 ~ 42	DB0 ~ DB3	—	Not used. Connected to GND (0 V)
43 ~ 46	DB4 ~ DB7	In/Out	Data bus
47 ~ 62	COM1 ~ COM16	Out	Common signal/output

REGULATOR IC (IC204: BA9700A)

The regulator IC controls the output voltage by PWM (Pulse Wide Modulation) with outer switching transistors and LC filters (integration circuit).



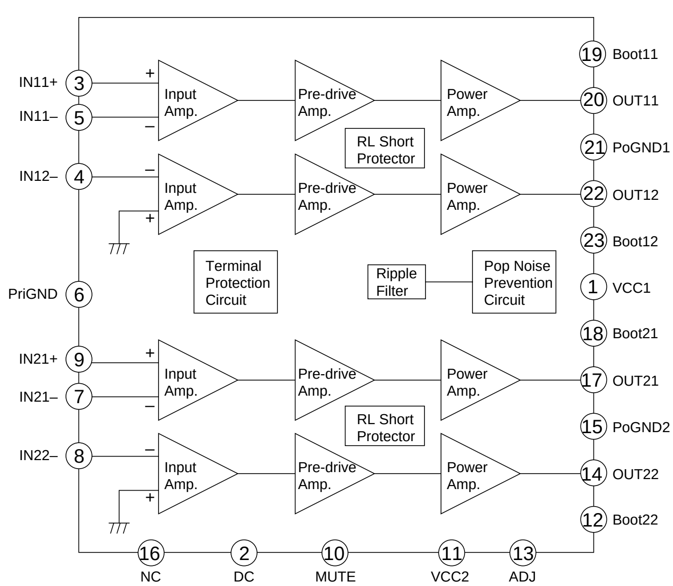
DAC (LSI1: UPD6376GS)

UPD6376GS is a two-channel 16-bit Digital to Analog Convertor consisting of resistor string, output amplifier and zero offset circuit.
The DAC receives 16-bit serial data output from the DSP. The data contains digital sound data of the melody, chord, bass, and percussion for the right and left channels. The DAC converts the data into analog waveforms by each channel and output them separately.

Pin No.	Terminal	In/Out	Function
1	SEL	In	Mode selection terminal. Connected to ground.
2	D.GND	In	Ground (0 V) source for internal digital circuit
3	NC		Not used.
4	DVDD	In	+5 V source for internal digital circuit
5	A.GND	In	Ground (0 V) source for internal analog circuit
6	R.OUT	Out	Sound waveform output
7	A.VDD	In	+5 V source for internal analog circuit
8	A.VDD	In	+5 V source for internal analog circuit
9	R.REF	In	Reference voltage terminal. Connected to a capacitor.
10	L.REF	In	Reference voltage terminal. Connected to a capacitor.
11	L.OUT	Out	Left channel sound waveform output
12	A.GND	In	Ground (0 V) source for internal analog circuit
13	LRCK	In	Word clock (L/R separation signal) input.
14	LRSEL	In	Not used. Connected to ground.
15	SI	In	Sound data input
16	CLK	In	Bit clock input

POWER AMPLIFIER (IC301: LA4620)

The power amplifier is a two-channel amplifier with standby switch.



DIAGNOSTIC PROGRAM

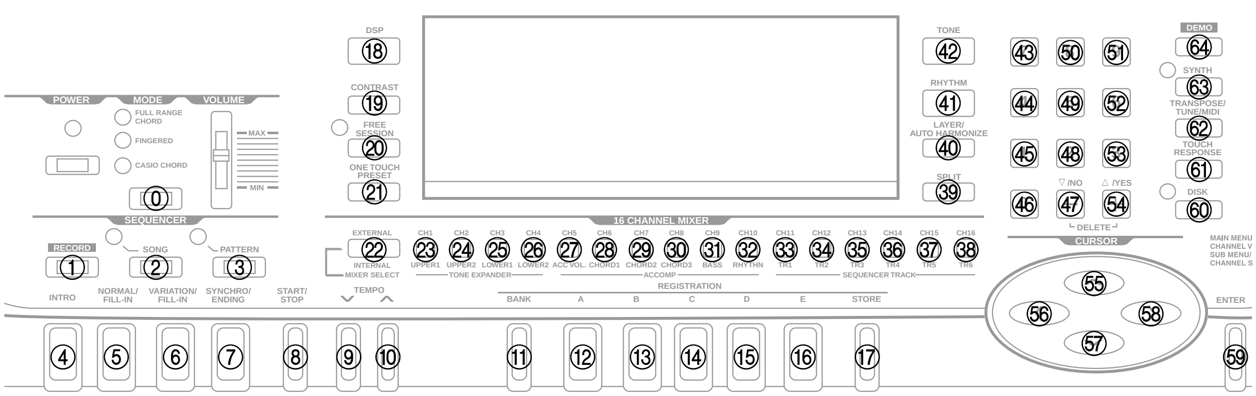
■ To enter diagnostic mode

1. While pressing down “0” and “ACCOMP CHORD MODE” buttons, press “POWER” button for turning on.
2. The instrument is set in diagnostic mode and display indicates “Test”.

■ Button check

1. Press “0” button.
2. Display indicates “Console”.
3. Press buttons in the following order

(0) MODE button
(1) RECORD button
(2) SONG button
(3) PATTERN button
(4) INTRO button
(5) NORMAL/FILL-IN button
(6) VARIATION/FILL-IN button
(7) SYNCHRO/ENDING button
(8) START/STOP button
(9) TEMPO button down
(10) TEMPO button up
(11) BANK button
(12) REGISTRATION buttons A
(13) REGISTRATION buttons B
(14) REGISTRATION buttons C
(15) REGISTRATION buttons D
(16) REGISTRATION buttons E
(17) STORE button
(18) DSP (digital effect) button
(19) CONTRAST button
(20) FREE SESSION button
(21) ONE TOUCH PRESET button
(22) MIXER SELECT button
(23) CHANNEL button CH1
(24) CH2
(25) CH3
(26) CH4
(27) CH5
(28) CH6
(29) CH7
(30) CH8
(31) CH9
(32) CH10
(33) CH11
(34) CH12
(35) CH13
(36) CH14
(37) CH15
(38) CH16
(39) SPLIT button
(40) LAYER/AUTO HARMONIZE button
(41) RHYTHM button
(42) TONE button
(43) Number key 7
(44) Number key 4
(45) Number key 1
(46) Number key 0
(47) Number key –
(48) Number key 2
(49) Number key 5
(50) Number key 8
(51) Number key 9
(52) Number key 6
(53) Number key 3
(54) Number key +
(55) Cursor key Up
(56) Cursor key Left
(57) Cursor key Down
(58) Cursor key Right
(59) ENTER button
(60) DISK button
(61) TOUCH RESPONSE button
(62) TRANSPOSE/TUNING/MIDI button
(63) SYNTH button
(64) DEMO button



Display shows the button number to be pressed. When the pressed button functions properly, the instrument emits a verification signal and indicates next button number.
If the button malfunctions, an error alarm sounds and display indicates “Cons ER”.
When wrong button is pressed, the alarm sound is also emitted. In that case, re-press the correct button.

Bender check

1. While pitch bender is left untouched, press "–" button.

2. Display indicates "Bender".

3. If the bender's center point is adjusted correctly, the instrument emits verification sound. If the center point is improper, an error alarm sounds and display indicates "Bend ER" and the instrument exits from the diagnostic program.

4. Rotate the bender all the way to the upper position.
   When the program detects upper most position, it emits verification sound. If wrong direction (toward lower position) of bender rotation is detected, the instrument exits from the diagnostic program after emitting an alarm sound and displaying "Bend ER".

5. Reset the bender on the center position.
   A verification tone sounds.

6. Rotate the bender all the way to the lower position.
   When the program detects lower most position, it emits verification sound.
   If wrong direction (toward upper position) is detected, the instrument exits from the diagnostic program after emitting an alarm sound and displaying "Bender ER".

7. Reset the bender on the center position.
   The instrument exits from diagnostic program after emitting a verification sound and displaying "Bend OK". (During and after the check, display indicates bender values until another button is pressed.)

AC adaptor detection check.

1. Press "+" button.

2. When the instrument detects that an AC adaptor is plugged in, it indicates "Jack OK" on the display.
   If it judges that no AC adaptor is inserted (powered by batteries), it indicates "Jack ER" on the display.

Keyboard, Sustain pedal, and Modulation switch check

1. Press "1" button.

2. Display indicates "TouchSus".
   In accordance with key, sustain pedal, or module switch depressions, display indicates velocity value (hexadecimal values 01 to 7F), "SUS", or "Mod".

ROM check

1. Press "2" button.

2. The diagnostic program counts check sums of 8Mbit and 16Mbit ROMs.

3. In accordance with ROMs functions, display indicates;

   "ROM OKOK" -------------- Both ROMs function normally
   "ROM OKER" -------------- 8Mbit ROM OK, 16Mbit ROM NG
   "ROM EROK" -------------- 8Mbit ROM NG, 16Mbit ROM OK
   "ROM ERER" -------------- Both ROMs are NG

■ RAM check

1. Press “3” button.
2. The program executes write/read test in all the RAM area.
3. When the RAM is proper, display indicates “RAM OK”.
   If the RAM malfunctions, “RAM NG” is shown on the display.
4. When the RAM check is executed, other tests become unavailable.
5. Pressing any key performs “Bender reset” transaction described below.

■ Small sound output

1. Press “4” button.
2. The instrument emits a sound in small volume and indicates “MIN” on the display.

■ Medium sound output

1. Press “5” button.
2. The instrument emits a medium volume sound and indicates “MID” on the display.

■ Large sound output

1. Press “6” button.
2. The instrument emits a large volume sound and indicates “MAX” on the display.

■ Large sound left channel output

1. Press “7” button.
2. The instrument emits a large volume sound from the left speaker and indicates “L” on the display.

■ Large sound right channel output

1. Press “8” button.
2. The instrument emits a large volume sound from the right channel and indicates “R” on the display.

■ MIDI IN/OUT test

1. Connect MIDI IN and MIDI OUT terminals with a MIDI cable.
2. Press “9” button.
3. When the MIDI circuit is normal, display indicates “MIDI OK” whereas “MIDI ER” will be shown if the MIDI circuit is abnormal.

■ LCD test

1. Press “CURSOR ←” button.
2. Display indicates “LCD OK”.
3. Each pressing of “CURSOR ←” button, displays following patterns in the following order with verification sound.

   a. Checker on 8 character block : pattern A
   b. Checker on 8 character block : pattern B
   c. Checker on pixel block : pattern A
   d. Checker on pixel block : pattern B
   e. All dots indication
   f. Displays each pixel (or dot) block in turn + all dots indication
   g. Displays each dot in turn + all dots indication

■ LED test

1. Press “CURSOR →” button.
2. Display indicates “LED Test” and LEDs illuminate in the following order with verification sound.

   a. FULL RANGE CHORD
   b. FINGERED
   c. CASIO CHORD
   d. SONG
   e. PATTERN
   f. FREE SESSION
   g. SYNTH
   h. DISK

■ FDD test

1. Press “DISK” button.
2. Display indicates “Disk0-9E” (which means numeral key 0 to 9 and ENTER button.)
   This test executes floppy disk’s write/read test and entering a number selects sectors to be tested.
   Larger the number, narrower the check area namely, entering 0 checks all the sectors of the disk.
3. Press “ENTER” button to clean the FDD with cleaning disk. Wet type cleaning disk is recommended.

■ To exit from the diagnostic program

Pressing “CURSOR ↓” button sets the instrument in Reset power off state.

If you wish to use the instrument continually after this diagnostic program, perform “System reset” described below.

<Other utilities>

■ Bender reset

Sets bender's center point in initial value.

1. While pressing down "ENTER" and "ACCOMP CHORD MODE" buttons, turn the power on.
2. Display shows "BndReset" indicating that pitch bender's center point is initialized.
3. Perform the "System reset" described below.

■ System reset

1. While pressing down "ENTER" button, turn power on.
2. Display indicates "Reset?".
3. Pressing "+" button initializes the instrument.
   Pressing "–" button invalidates system reset.
4. The instrument turns on automatically.

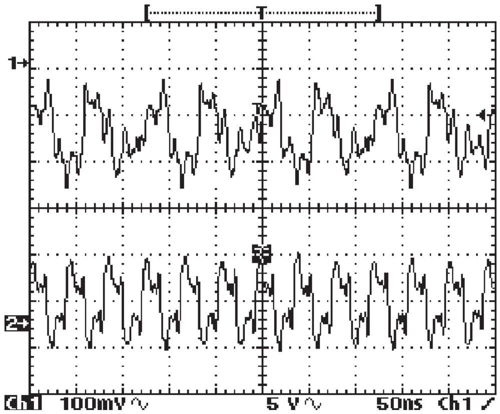
■ Touch off max

1. While pressing down "RHYTHM" and "ACCOMP CHORD MODE" buttons, turn the power on.
2. Display indicates "TouchMax".
3. The instrument is set in touch off max mode.
   In this state, sound volume in touch response off mode becomes maximum.

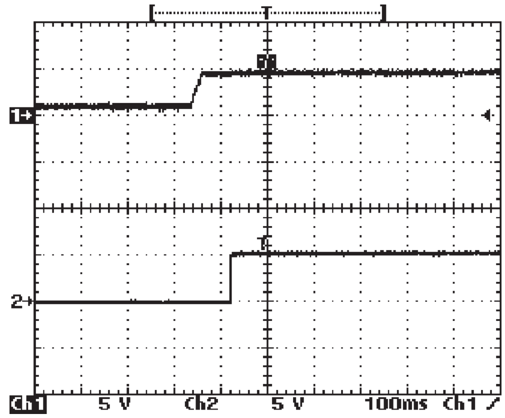
FDD ERROR MESSAGE

Error Message	Reason of Error
Err ReadOnly	The file being written to is read-only.
Err Format	The disk format is not one supported by this keyboard.
Err Disk R/W	Error occurred during reading from the disk.
Err DiskFull	Disk is full.
Err Mem Full	Not enough memory to perform the process. No memory is available to load data.
Err Not SMF0	An attempt was made to play data that is not SMF FORMAT 0.
Err No Disk	An attempt was made to access a disk while no disk is loaded in the drive.
Err No File	There is no file that corresponds to the file that was specified.
Err Protect	A save or delete operation was attempted with a disk that is write protected.
Err Convert	The attempted file conversion was not successful.
Err WrongDat	Something is wrong with the data you are trying to load.

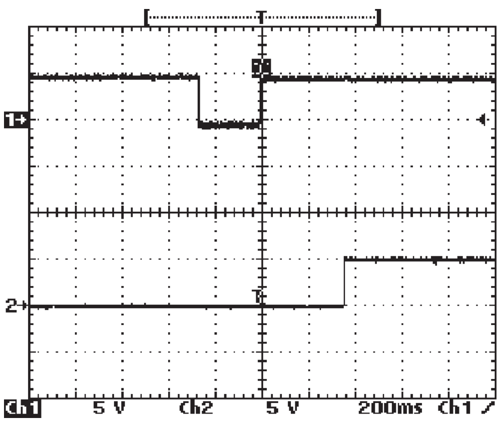
MAJOR WAVEFORMES

① ②


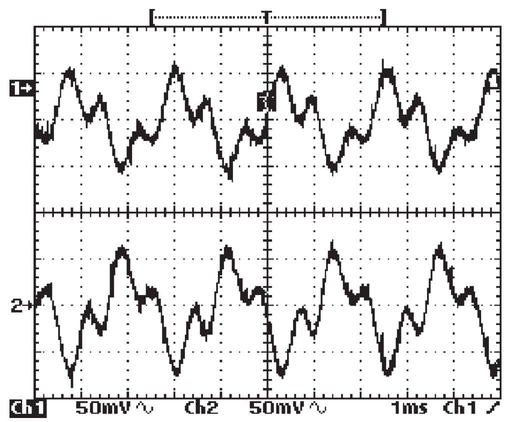
① Clock signal for CPU
Check point CP1
② Clock signal for DSP
Check point CP2

③ ④


③ Voltage VDD
IC3 pin 2
④ Reset signal $\overline{\text{RES}}$
IC3 pin 1

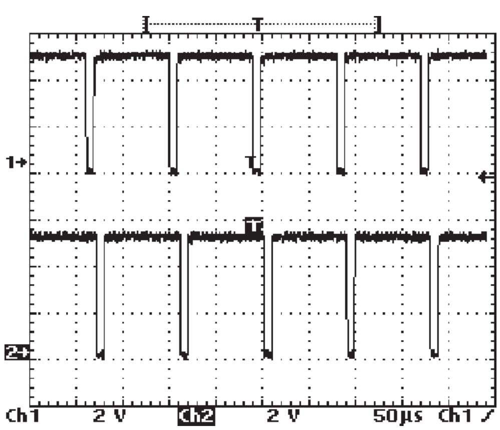
⑤ ⑥


⑤ NMI signal
LSI9 pin 64
⑥ Reset signal RESB
LSI9 pin 87

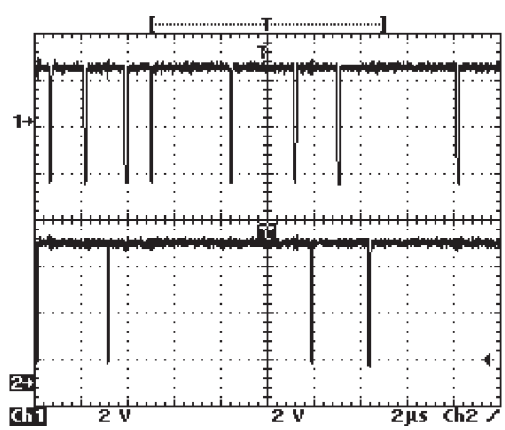
⑦ ⑧


⑦ Sound signal L-OUT
JC connector pin 10
⑧ Sound signal L-VOL0OUT
JG connector pin 5

Tone: Clarinet, Volume: Max.
Touch speed: Max., Key: A4

⑨ ⑩


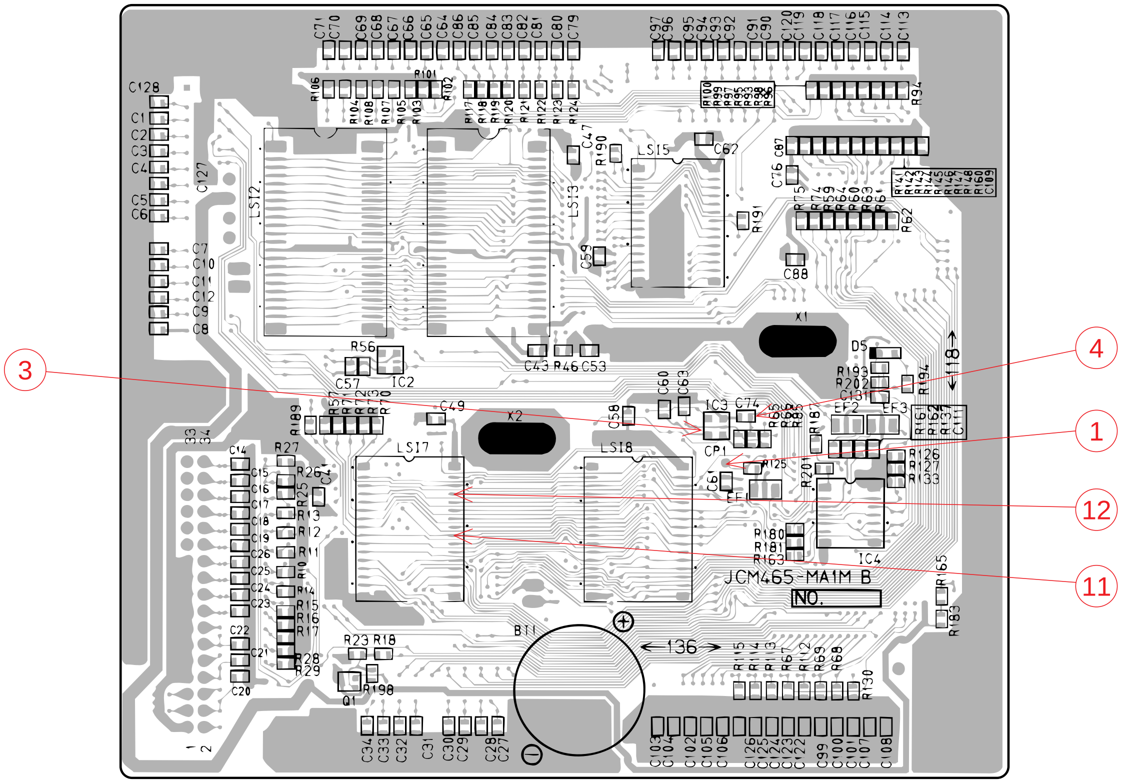
⑨ Key common signal KC0
JB connector pin 1
⑩ Key common signal KC1
JB connector pin 2

⑪ ⑫


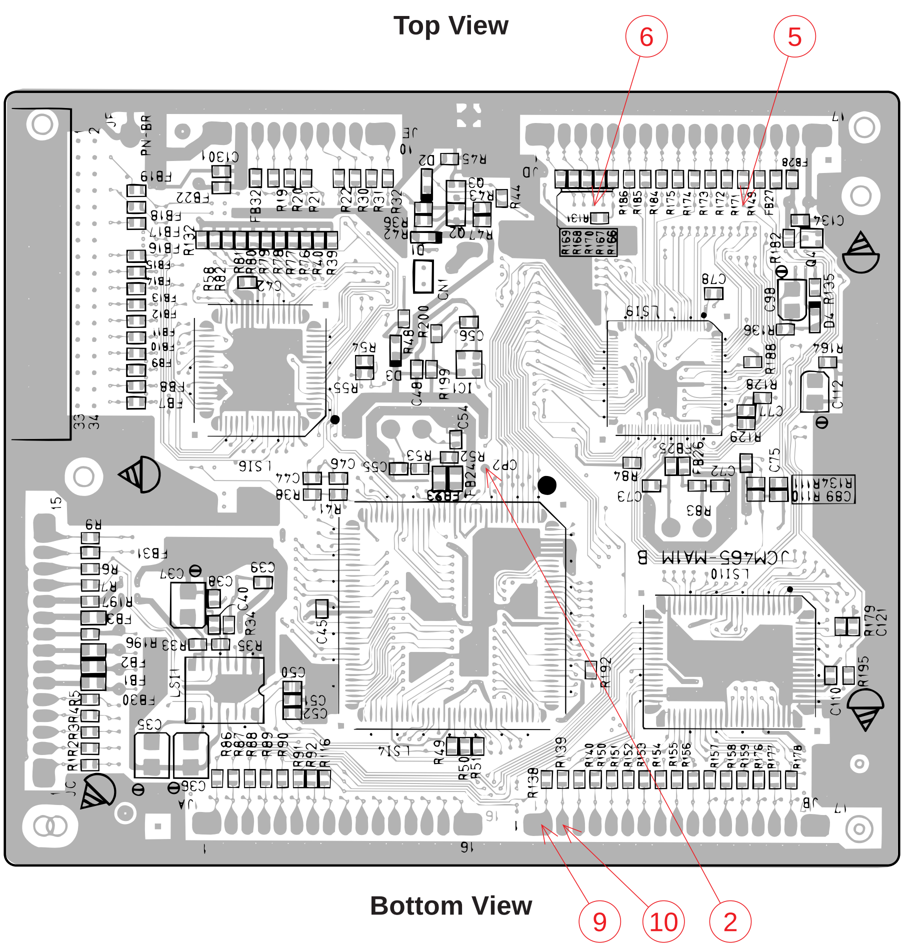
⑪ Read signal for RAM1
LSI7 pin 24
⑫ Write signal for RAM1
LSI7 pin 29

PRINTED CIRCUIT BOARD

Main PCB JCM465-MA1M

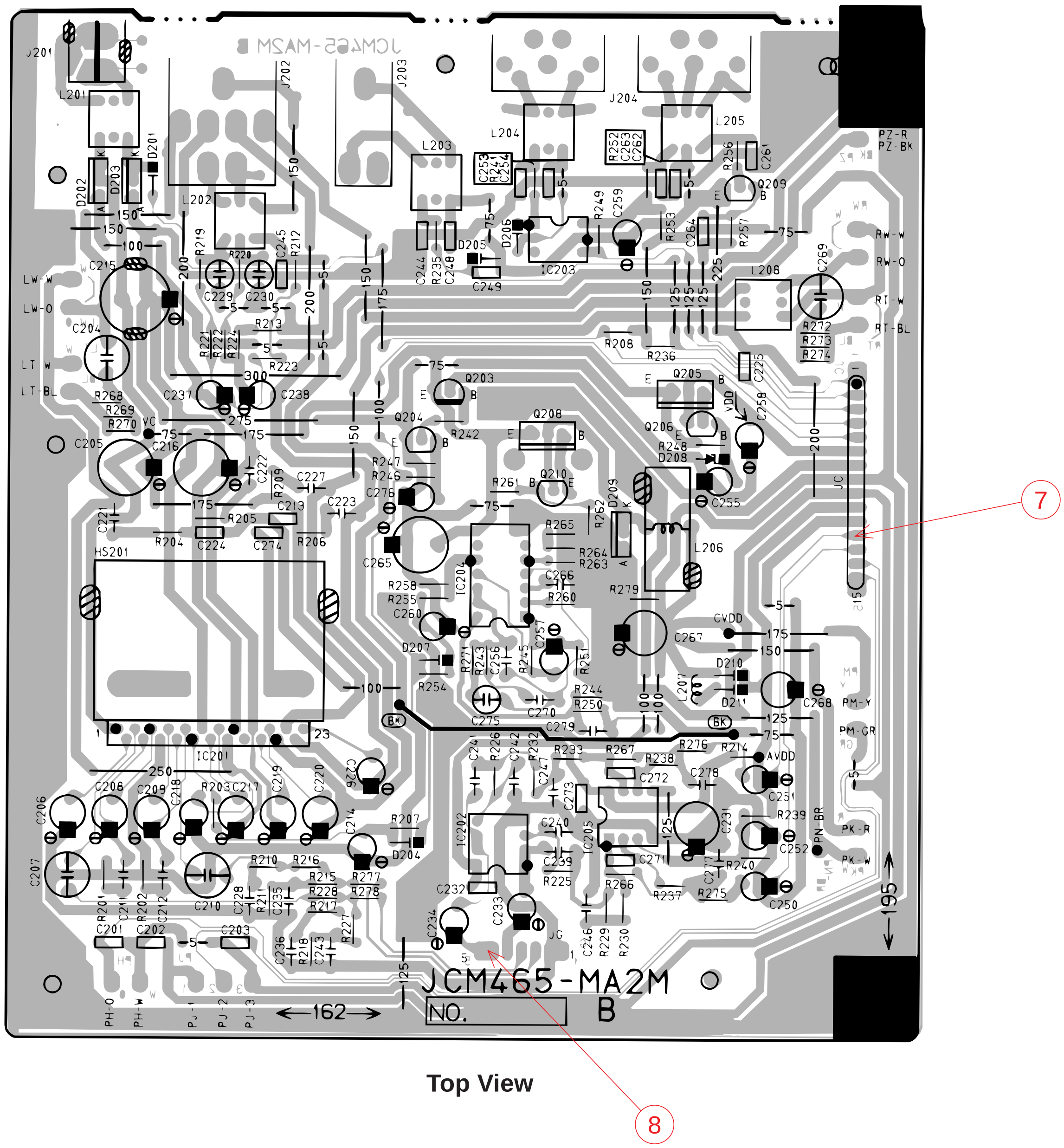


Top View



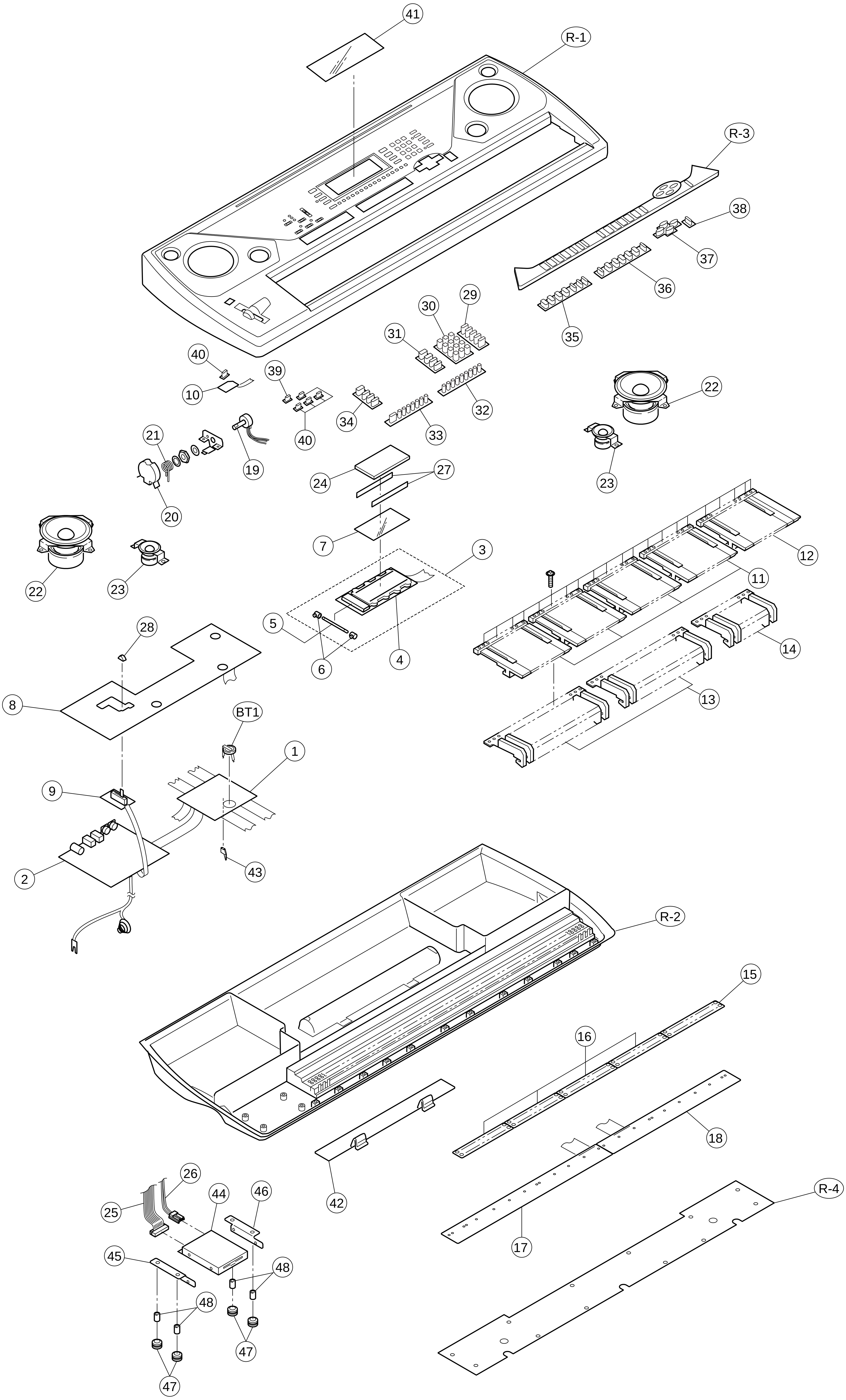
Bottom View

Sub PCB JCM465-MA2M



Top View

EXPLODED VIEW



PARTS LIST

Item	Code No.	Parts Name	Specification	Q	R
	MA1M PCB				
1	6926 8930	PCB/ASSY (MA1M)	M240837*1	1	A
LSI1	2114 4221	LSI	UPD6376GS-E1	1	A
LSI2	2012 6135	LSI	MX23C8100MC-12CA99	1	A
(LSI2)	(2012 6062)	(LSI)	(MSM27C802CZ-465)	(1)	(A)
LSI3	2012 6064	LSI	MX23C3210MC-12CA89	1	A
LSI4	2011 7434	LSI	HG51B155FD	1	A
LSI5	2012 5572	LSI	TC55257DFL-70L(EL)	1	A
LSI6	2010 9990	LSI	HD63266F	1	A
LSI7/LSI8	2012 5947	LSI	TC551001BFL-70L(EL)	2	A
LSI9	2012 6132	LSI	HD6433042SB51F	1	A
(LSI9)	(2012 6060)	(LSI)	(HD6473042F16-465)	(1)	(A)
LSI10	2012 5987	LSI	TC190C020AF-001	1	A
IC1	2105 1561	IC/CMOS	TC7S04F(TE85R)	1	B
IC2	2105 6355	IC/CMOS	TC7S00F(TE85R)	1	B
IC3	2012 1883	IC/MOS	RN5VD40AA-TR	1	B
IC4	2105 4935	IC/CMOS	TC74VHC08F(TP1)	1	B
Q1,Q3,Q4	2252 1169	TRANSISTOR/CHIP	2SC4081-T106S	1	B
Q2	2250 1169	TRANSISTOR/CHIP	2SA1576A-T106S	1	B
D1,D3,D4	2390 1820	DIODE/CHIP	1SS355TE-17	3	C
D2	2360 3057	DIODE/ZENER/CHIP	UDZTE-173.3B	1	C
X1	2590 2748	OSCILLATOR/CERAMIC	CSA16.00-MXZ243	1	C
X2	2590 2107	OSCILLATOR/CRYSTAL	HC-49S24A	1	C
BT1	3815 0707	BATTERY/LITHIUM	CR2032-1HM	1	A
	MA2M PCB				
2	6926 8990	PCB/ASSY (MA2M)	M140750*1	1	B
IC201	2114 1883	IC/MONOLITHIC	LA4620	1	B
IC204	2113 0084	IC/MONOLITHIC	BA9700A	1	B
IC202,205	2114 1799	IC/MONOLITHIC	M5218APR	2	B
IC203	2114 1421	IC/PHOTO COUPLER	PC900V	1	B
Q205	2251 0672	TRANSISTOR	2SB1548-P.CS	1	B
Q204,206,209	2252 0154	TRANSISTOR	2SC1740SS-TP-T	3	B
Q208	2252 1253	TRANSISTOR	2SB1566F	1	B
Q203,210	2250 0133	TRANSISTOR	2SA933SS-TP-T	2	B
D201,204~207, 210	2390 1344	DIODE	1SS133T-77-T	6	C
D208	2360 1085	DIODE/ZENER	HZS6B1LTD-T	1	C
D202,203,209	2390 1463	DIODE/SHOTTKY	SB20-03B	3	C
J201	3501 5012	JACK/DC	HEC2305-01-920	1	C
J202	3612 0665	JACK	YKB21-5006	1	C
J203	3612 0789	JACK	YKB21-5010	1	C
J204	3501 4816	JACK/DIN	YKF51-5051	1	C
L201,203,204, 208	3841 2154	COIL/COMMON MODE	SH-432	4	C
L202,205	3841 2175	COIL/COMMON MODE	SH-S132	2	C
L206	3841 2177	COIL	OH-022Z	1	C
	BL ass'y				
3	6926 9030	BL/ASSY	M240682*2	1	A
4	6926 9050	PCB/ASSY (LD1M)	M240838*1	1	A
5	3122 3558	CFL	HMBV26BG1W63N/AZG	1	A
6	5861 3522	HOLDER/CFL	HRB-0256	2	C
7	6925 9490	PLATE/BL	M340602-1	1	C
LSI501	2012 6018	LSI	SED1278F2A	1	A
Q501/502	2253 0710	TRANSISTOR	2SD965-R(TA)	2	B
Q503	2250 0133	TRANSISTOR	2SA933SS-TP-T	1	B

Notes: Q – Quantity per unit
R – Rank

Item	Code No.	Part Name	Specification	Q	R
Q504	2252 0154	TRANSISTOR	2SC1740SS-TP-T	1	B
D501	2360 3056	DIODE/ZENER	HZS6A2LTD-T	1	C
D502	2390 1344	DIODE	1SS133T-77-T	1	C
L501	3841 1197	COIL	LHL08TB101K	1	C
T501	3012 1470	INVERTER TRANS	NT-07	1	B
	CN1 ~ CN3 PCBs				
8	6926 9070	PCB/ASSY (CN1M)	M140751*1	1	B
9	6926 9080	PCB/ASSY (CN2M)	M340815*1	1	B
10	6926 9090	PCB/ASSY (CN3M)	M340816*1	1	B
IC301,302	2105 1239	IC/CMOS	TC74HC164AP	2	A
LED301	2370 1383	LED	TLR124(TPJ56,KT)	1	C
LED302~309	2370 1403	LED	TLG124A(TPJ56)	8	C
VR301	2765 2178	VOLUME/SLIDE	EWASC2C95B23	1	B
	Keyboard				
11	6922 2720	KEY SET/LT WHITE	M312118*1	4	A
12	6922 2730	KEY SET/LT WHITE	M312118*2	1	A
13	6906 8482	KEY SET/LS BLACK	M140369B-3	2	A
14	6906 8592	KEY SET/LS BLACK	M140369B-4	1	A
15	6926 2500	RUBBER/KEY	M240699-2	4	B
16	6926 2510	RUBBER/KEY	M240700-2	1	B
17	6926 9130	PCB/ASSY (KY1M)	M140687*2	1	B
18	6926 9140	PCB/ASSY (KY2M)	M140688*2	1	B
	Bender				
19	2765 1141	VOLUME	RK1631110-50KB	1	B
20	6926 9450	KNOB/BENDER	M340796-1	1	B
21	6926 9460	SPRING/BENDER	M440654-1	1	C
	Panel				
22	3831 1081	SPEAKER	S12J85A	2	B
23	3831 1082	SPEAKER	S05JH39A	2	B
24	3335 6728	LCD	LD-B10294E	1	A
25	3502 2446	CONNECTOR/24P	RA-34P-900-M465	1	X
26	3502 2447	CONNECTOR/2P	AMP-2P-720-M465	1	X
27	6926 2540	CONNECTOR/FOR LCD	M440459-2	2	C
28	6921 5030	KNOB/SLIDE	M311859-1	2	B
29	6926 9280	RUBBER/BUTTON	M240800-1	1	B
30	6926 9290	RUBBER/BUTTON	M240801-1	1	B
31	6926 9300	RUBBER/BUTTON	M240802-1	1	B
32	6926 9310	RUBBER/BUTTON	M240803-1	1	B
33	6926 9320	RUBBER/BUTTON	M240804-1	1	B
34	6926 9330	RUBBER/BUTTON	M240805-1	2	B
35	6926 9340	RUBBER/BUTTON	M140720-1	1	B
36	6926 9350	RUBBER/BUTTON	M240807-1	1	B
37	6926 9360	RUBBER/BUTTON	M240808-1	1	B
38	6926 9370	RUBBER/BUTTON	M340788-1	1	B
39	6925 9380	RUBBER/BUTTON	M240641-1	1	B
40	6925 9410	RUBBER/BUTTON	M240640-1	1	B
41	6926 9240	PLATE/DISPLAY	M240813-1	1	C
42	6918 1630	COVER/BATTERY	M311164*1	1	B
43	3502 2318	CONNECTOR/LITHIUM BATT.	MLES-A60-T	1	C
44	1015 1399	FDD UNIT	DF354H064A	1	A
45	6926 9400	PLATE/FDD	M340792-1	1	X
46	6926 9410	PLATE/FDD	M340793-1	1	X
47	6926 9420	RUBBER/DAMPER	M440598-2	4	X
48	6926 9431	SPACER	M440597A-1	4	X

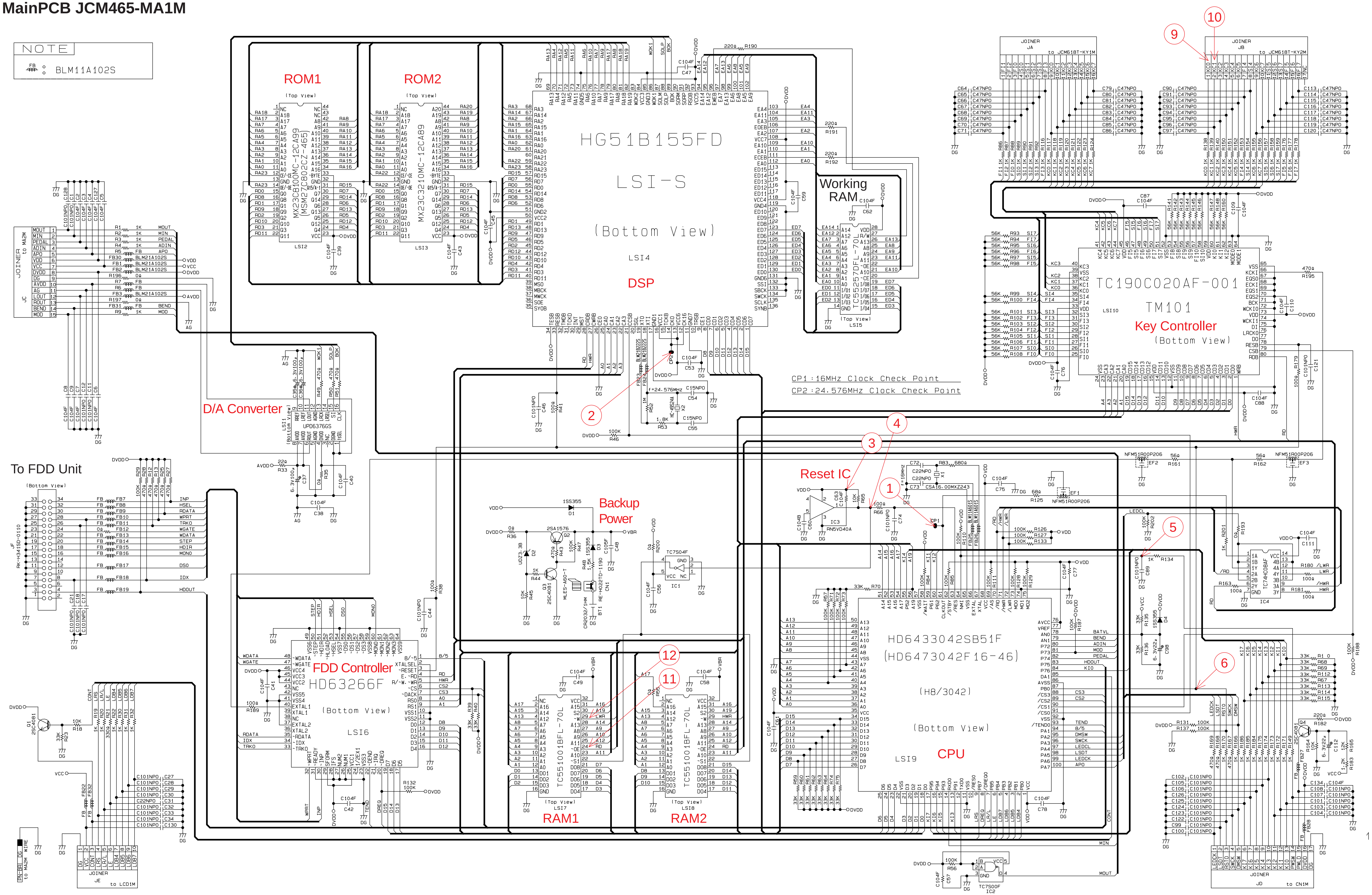
Notes: Q – Quantity per unit
R – Rank

Item	Code No.	Part Name	Specification	Q	R
	Accessory				
	6926 9540	STAND/MUSIC	M140744-1	1	C
	6926 9210	DISK/FLOPPY	811FD-PRG	1	X
	6926 9220	DISK/FLOPPY (Others)	811FD-SMP-1	1	X
	6926 9230	DISK/FLOPPY (USA,CANADA only)	811FD-SMP-2	1	X

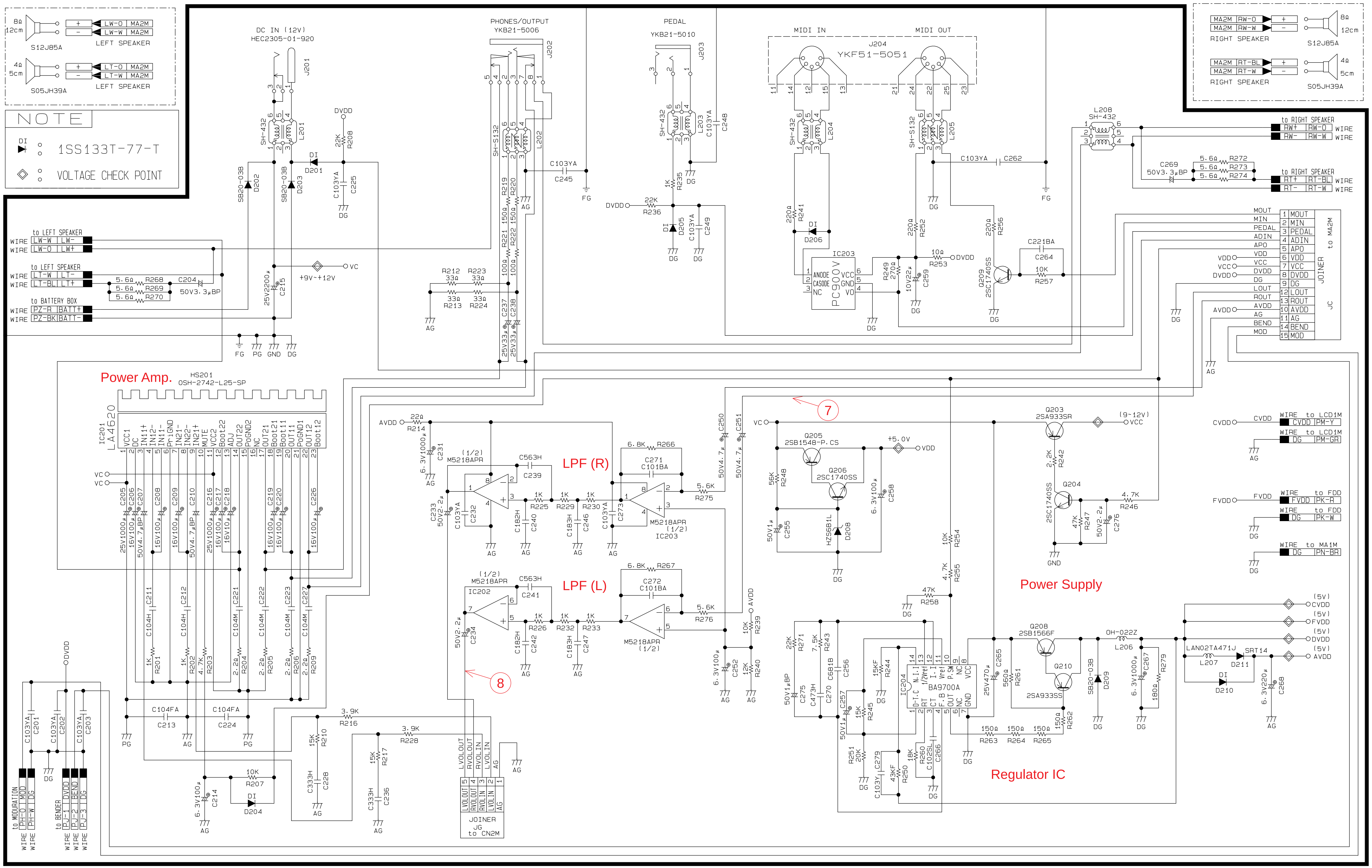
Notes: Q – Quantity per unit
R – Rank

SCHEMATIC DIAGRAMS

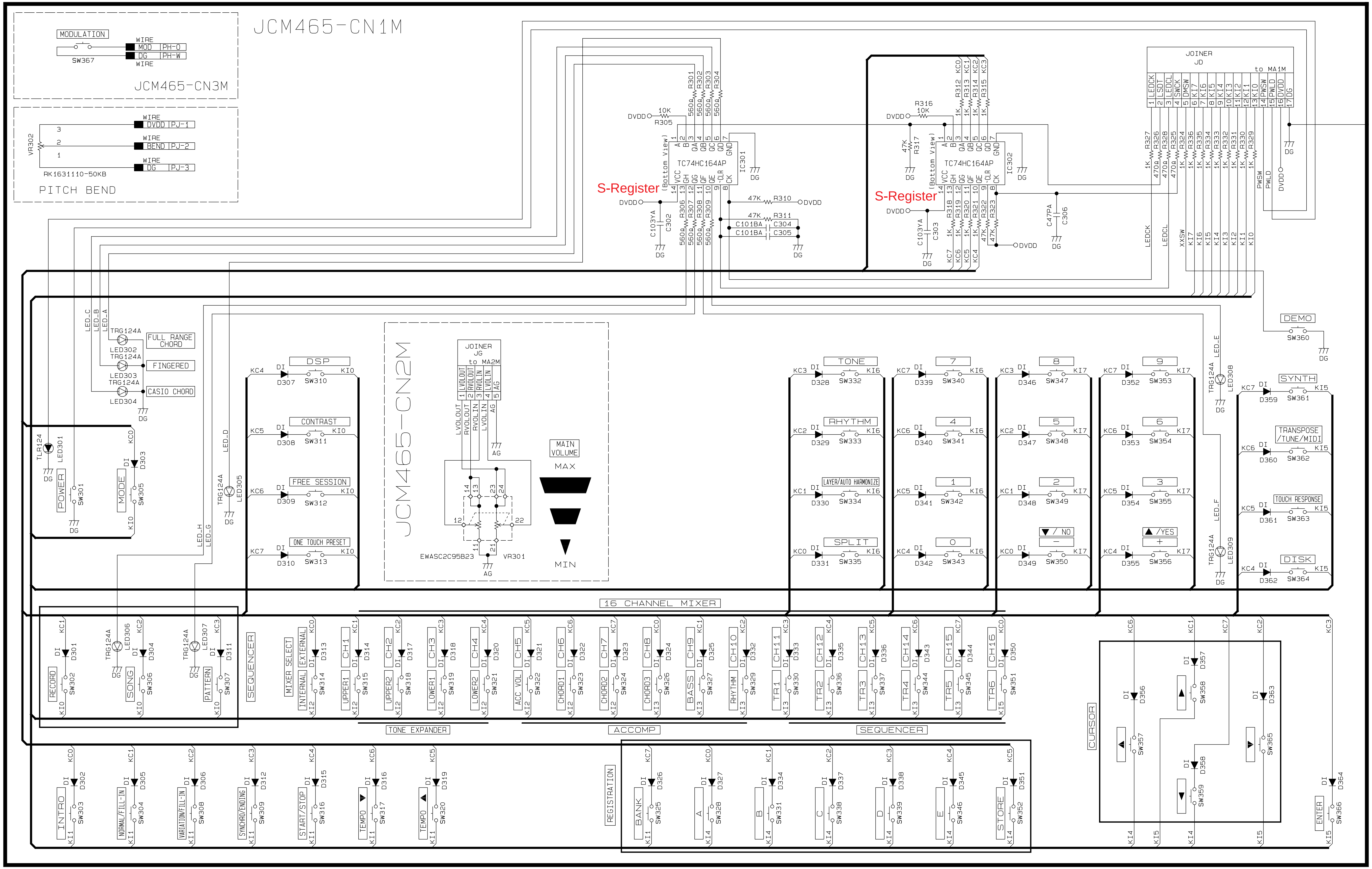
MainPCB JCM465-MA1M



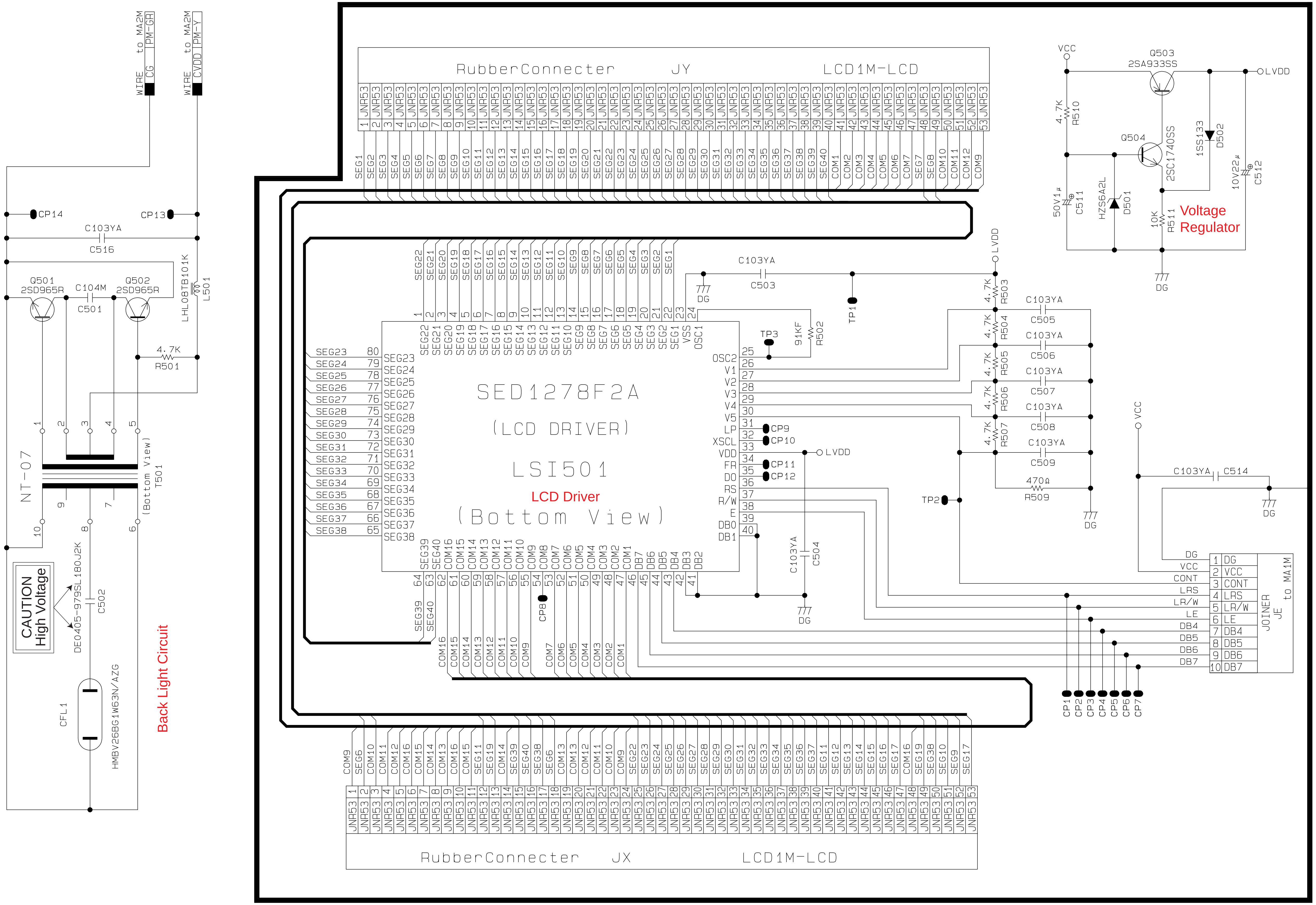
SubPCB JCM465-MA2M



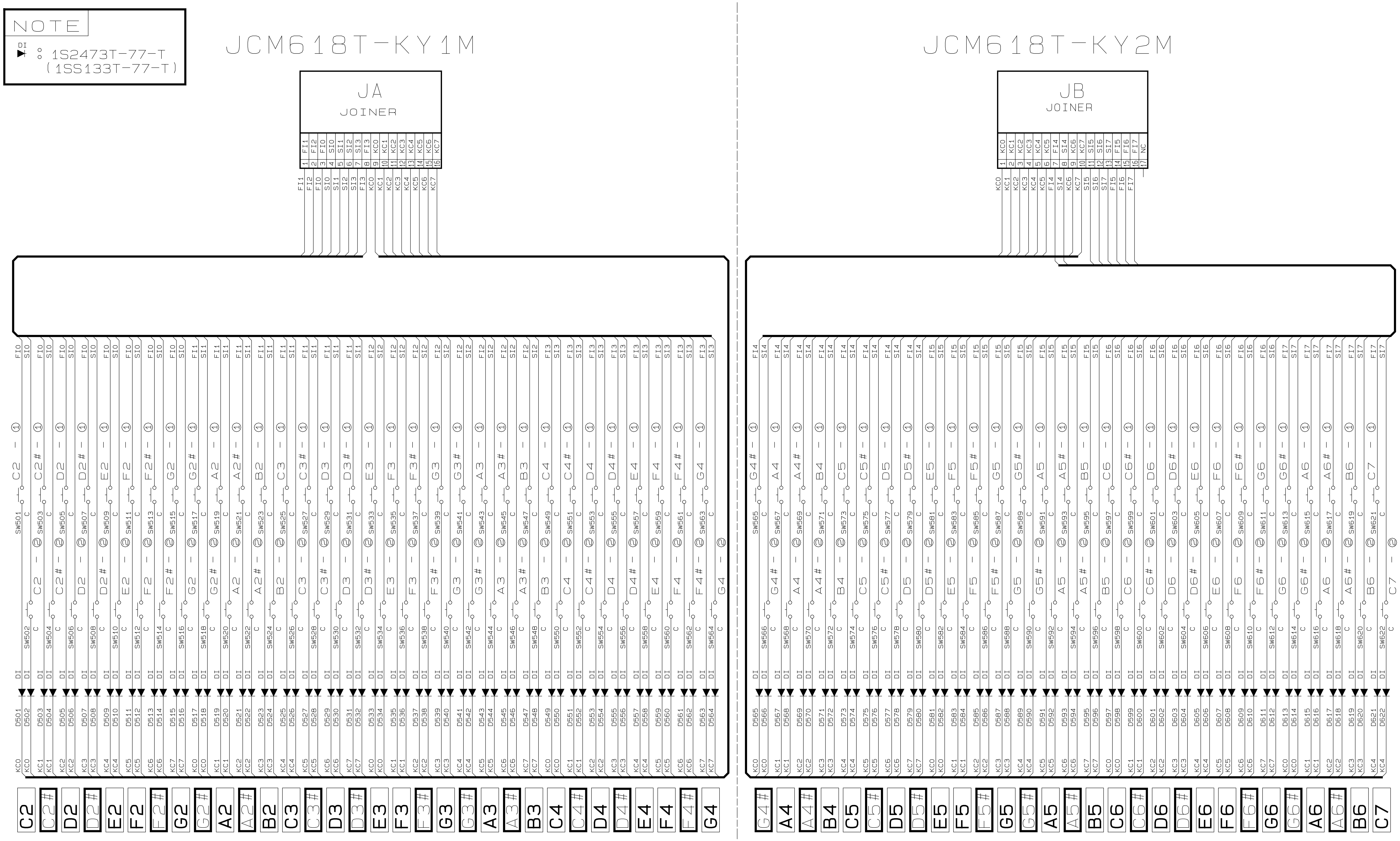
Console PCBs JCM465-CN1M/CN2M/CN3M



LCD Driver PCB JCM465-LCD1M



Keyboard PCBs JCM618T-KY1M/KY2M



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